

Critical Review of the Family PROCELLARIIDÆ:—Part IV; Embracing the ÆSTRELATÆ and the PRIONÆE.

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In the present paper, the fourth of the series, are together considered the *Æstrelatæ* and the *Prionæ*, mainly for the purpose of showing how closely related these sections are through certain of their genera.

For the first of these sections three names are at our disposal; sc. *Æstrelatæ*, *Daptionæ* and *Rhantistæ*. Of these I prefer to accept the first, both as having priority, and being taken from the name of the typical and largest genus of the group; the second being based upon a subtypical genus with but a single species, and the third being derived from Bonaparte's erroneous identification of Kaup's Fulmarine genus *Rhantistes*.

The section *Æstrelatæ*, as here restricted, corresponds very nearly with the group defined under this name in Bonaparte's *Conspectus*. There is here, however, included in it the genus *Daption**, by Bonaparte placed among the *Fulmaræ*; and it is considered as probably connecting the *Æstrelatæ* with the *Prions*. The genus *Thalassoica* is excluded as being essentially Fulmarine. In generic arrangement I am compelled to differ widely from the distinguished author just named. After attentive and critical examination of his genera *Cookilaria*, *Pterodroma* and *Bulweria*, I must confess my inability to distinguish either of them from *Æstrelata* by a degree of morphological difference which, by any sublimation of characterization, can be considered of generic import. "*Bulweria*" has a rather more elongated and decidedly cuneiform tail than have the majority of the *Æstrelatæ*; but differs from some of them in this respect, no more than they do among themselves. "*Pterodroma*" comprises some fuliginous species morphologically identical with *Æstrelata*. "*Cookilaria*" has no characters whatever assigned to it by its author; possibly because none are to be found in the species included under it.

I do not hesitate to follow natural data afforded by specimens, even should they conflict with the opinions of so justly distinguished an author as that of the "*Conspectus*;" especially since the more closely I scrutinize his work upon the Petrels, the more irresistibly the conviction is forced upon me, that it is, to speak in the mildest terms, unreliable. It cannot be denied by the most strenuous of his advocates, that there are to be found in this work instances of unnecessary if not unwarrantable pseudo-generic subdivisions; of some pure figments in the way of species; of rash collocation of synonymy; and of weak and intangible diagnoses. These are to the last degree discouraging, because perplexing, to the student.—*crede mihi esperto*. They would, however, be less repellant, and bear much more weight, could we feel satisfied that they represented the matured opinions of the author, based upon well-digested facts. Such unhappily is not the case; for the views expressed on different occasions are found to fluctuate according to the particular theory which may have been in possession of his mind at the time of writing; and are often diametrically opposed to each other. That I may not seem to wantonly criticise one of the most brilliant lights that has ever shed its radiance upon Ornithology, to whom alas! it was not permitted to finish his last great work, I may be allowed to sustain myself by a simple comparison of the "*Conspectus*" with the Table of the Longipennines published in the *Comptes Rendus*. The fasciculi of the former which treat of the Petrels bear date of Dec., 1855, and Jan., 1856; the latter is of the séance of April 28, 1856. I only cite some of the more glaring discrepancies of generic arrangement and distribution of species; for concerning synonymy it may be stated that as a general rule conflicting views are entertained on all debatable points.

* The true relationship of this genus is still with me a matter of some uncertainty.

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C. A. Genus *Majaqueus* placed among the *Puffinæ*; *Pterodroma* and *Pagodroma* among the *Estrelatæ*.—C. R. These three genera placed among the *Fulmaræ*.

C. A. *Priocella Garnotii*, H. and J. (= *Thalassoica glacialoides* according to Gray) not recognized.—C. R. Given as a valid genus and species of *Fulmaræ*.

C. A. *Proc. meridionalis* Lawr. considered as a synonym of *Estrelata diabolica*.—C. R. Given as a valid species of genus *Fulmarus*.

C. A. Genus *Adamastor* founded and considered as a component of the *Fulmaræ*, with *typus* Bp. (= *cinerea* Gm.) *sericeus* Less. and *flavirostris* Gould, as its species.—C. R. Genus *Adamastor* abandoned, and its three species distributed thus:—*typus* (here called *cinerea* Gm.) is put under *Priofinus*,* among the Puffins; *flavirostris* and *sericeus* (the latter queried as to validity) are put under *Estrelata* of the "*Rhantistæ*."

C. A. Genus *Cookilaria* established with *leucoptera* Gould, *velox* Solaud., *solandri* Gould, and *mollis* Gould, as its species.—C. R. *Cookilaria* abandoned. *Rhantistes* ex Kaup† taken, with *Cookii* Gray, *velox* Sol. *mollis*, "unicolor," "raolensis" Gould, and *Lessoni* Garnot as determined species; *rostrata*, *parvirostris* Peale, *gelida* Gm. and *sandaliata* Sol. as doubtful species.

C. A. Genus *Estrelata* contains *diabolica* L'Herm. (syn. *hesitata* Temm. Kuhl.) *desolata* Gm. *inexpectata* Forst. (= *mollis* Gould) and *leucocephala* Forst. (= *Lessoni* Garnot.).—C. R. The same genus is made to contain *diabolica* L'Herm. *hesitata* Temm. (here considered distinct from *diabolica*), *sericea* Less. *flavirostris* Gould, *desolata* Lath.; with *gularis* and *brevipes* Peale, and *inexpectata* Forst. as doubtful species.

C. A. Genus *Nectris* Bp. emend. ex Forst. contains *brevicauda* Brandt, *carneipes* Gould, *fuliginosus* Strickl. *gamma* Bp. and *tenuirostris* Temm.—C. R. *Nectris* abandoned, and its species thus distributed: *brevicauda* and *carneipes* are put with *cinereus* Gm. under *Priofinus* H. & J.; *fuliginosus* Strickl. is made a queried synonym of *Puffinus major* Faber; *gamma* Bp. does not appear; while *tenuirostris* is united with *sphenurus*, etc., under the genus *Thiellus*.

However great the changes and innovations thus introduced,—which are indeed "une foule des faits nouveaux relatifs à la classification, à la nomenclature, à la synonymie, et aux divers rapports des espèces," resulting "de leur étude approfondie"‡ between Dec. 1855 and April 1856, I am unwilling to believe that the "Table" is drawn up with reference to the size and shape of the Comptes Rendus page, rather than in accordance with truth.

The numerous difficulties which beset us in the critical investigation of any group of the Petrels, reach their maximum in the section now under consideration. This is in a measure due to the habitat of most of the species—the genera being essentially South Pacific and Antarctic in their distribution—which renders the acquisition of specimens difficult, at least in such numbers as to enable extended comparisons to be instituted, and the great changes of plumage which a majority of the species undergo with increasing age, to be fully and accurately elucidated. Some are to this day known only by type specimens; while of many others we are no more familiar regarding variable features of coloration, than to enable us to speak in the most general terms of the changes undergone during progress towards maturity. But these are among the minor evils to be contended with; for Nature herself is perhaps never so difficult of comprehension, as we often find our attempts to understand her to be. And so the confounding of distinct species under one name and description; the making of nominal ones out of changes of plumage and variations in size; together with the misinterpretation by writers of the labors

* This is an important correction. "*Priofinus cinereus*" is the proper name of the species called in the C. A. "*Adamastor typus*."

† This name of Kaup's is a synonym of *Fulmarus* Leach.

‡ Bp. C. R. April 28, 1856, p. 767.

of their predecessors, have produced a bibliography so *embrouillée* as to defy our most patient efforts to completely unravel the entangled skein, and to cause us to turn with weariness if not disgust from the hopeless task. The necessity which exists for the *study*—I use the word advisedly—of synonyma, is the opprobrium of ornithology; and the kind of labor demanded for their elucidation is far removed from the real pursuit of science itself. At the same time, while an inevitable, it is too often a thankless labor, and one hardly appreciated; the results of which are usually incommensurate with the time and trouble expended. Collocation of synonyma is by no means mere clerical compilation. It is a species of investigation which, to be productive of any value, demands a sound judgment and powers of discrimination perhaps of as high a grade as those required for the successful study of genera and species. But it does not often bring to its author such rewards as are willingly granted him who elucidates other classes of facts in Natural History. For as its chief duty is to deal with disputed points, it enters an arena where more conspicuously figure not facts but rather opinions; concerning which the right of arbitration is yielded by no man to another. The synonymist must ordinarily expect acquiescence with his views from those only whose ideas are not jostled by the opinions he advances.

It is impossible to pursue a critical investigation of the *Procellariide* without being impressed by these facts; which must be my only weapon wherewith to turn the edge of criticism from my efforts towards the elucidation of the family. No one can be more painfully aware of the errors of omission and doubtless also of commission, which must be met with in these papers; and none can be less tenacious of debatable views, or more ready to relinquish opinions when proof of their fallacy is made apparent. I only ask a thorough examination before a condemnatory fiat is passed upon any of the views entertained which may be at variance with current opinions.

As a rule I have adopted for species no name to which any doubt as to identity attaches; while those still open to discussion I have endeavored to treat of solely with reference to their intrinsic merits, no extraneous claims to our consideration being acknowledged. I regret the necessity of frequent citations of manuscript names and unpublished drawings, which we are by no means bound to recognize; but which have become so interwoven with the bibliography of the family, that it is impossible to avoid so doing.

The present paper, like others of mine, is doubtless amenable to the charge of "discursiveness." This fault, if it be one, is certainly of that class which "lean to virtue's side;" and one which at present I feel indisposed to correct. Words are cheap enough; and had they not been so parsimoniously doled out in the earlier days of ornithology, there would now be less need of a profuse expenditure of them.

The *Estrclater*, as I regard them, are composed of three genera, which may be briefly diagnosticated as follows:—

A. Tail much graduated, or cuneiform.

I. Bill robust, compressed, the unguis large, and curved from the nostrils. Extension of feathers on forehead normal. Hallux small. Nostrils short..... *Estrclata*.

B. Tail slightly rounded.

II. Bill stout, compressed, unguis large, nostrils short. Forehead low, flat, the feathers encroaching far on the bill. Interramal space feathered. Hallux large and stout..... *Pagodroma*.

III. Bill greatly dilated. Nostrils long. Feathers on forehead normal in extension. Unguis small and weak. Interramal space partially naked. Hallux ordinary... *Daption*.

Color also affords us an excellent artificial index to these genera. Thus *Estrclata* is bicolor or fuliginous; *Pagodroma* is unicolor, white; and *Daption* is spotted with light and dark colors.

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The first of these genera, after the fusion with it of those of Bonaparte already adverted to, is quite an extensive one, comprising more species than any other of the family. In this paper I enumerate eighteen, which appear to have just claim to recognition. At the same time some of them, as I intimate, may not be valid, while I am quite willing to believe that there may exist good species of which no cognizance is here taken.

ÆSTRELATA Coes, [emend. ex Bp.]

Procellaria sp. Auctorum.

Daption sp. Stephens, Shaw's Gen. Zool. xiii. 1825.

Puffinus sp. Webb and Berthelot, Av. Canar. 1836—44.

Ossifraga sp. et *Thalassoica* sp. Reichenbach, Syst. Av.

Æstrelata, Bonap. C. A. 1855, ii. p. 188. Type *Proc. hesitata*, Temm.

Cookilaria, Bonap. C. A. 1855, ii. p. 190. Type *Proc. Cookii*, Gray.

Pterodroma, Bonap. C. A. 1855, ii. p. 191. Type *Proc. macroptera*, Smith.

Bulweria, "Bp. 1836." (Gray.) Bp. C. A. 1856, ii. p. 194. Type *Puff. columbinus*, Webb and Berthelot.

Rhantistes, Bonap. Compt. Rend., April, 1856, xiii. p. 768. Type *Proc. Cookii* Gray. (Not of Kaup, 1829, the type of which latter is *Proc. glacialis*, Linn.)

Chs.—Bill about as long as the tarsus; very stout; compressed; higher than broad throughout; lateral outlines nearly straight, converging to the much compressed unguis. Unguis particularly large, strong, its upper outline very convex, its tip greatly decurved; arising almost immediately from the end of the nasal tubes, leaving but a very brief and quite concave culmen proper. Lateral element of the bill very strong; rising high up at the root of the nasal case; somewhat inflated throughout; and with a strongly convex inferior border; which with the great decurvature of the unguis produces an extremely sinuate commissure; outline of lower mandible nearly straight; of gonys a little concave; eminentia symphysis well marked. Sulci on both upper and under mandibles distinct. Nasal tubes of moderate length, elevated, conspicuous, not carinated, dorsal outline about straight, apex more or less vertically truncated, orifice subcircular, each naris oval, separated from its fellow by a thin vertical portion which comes well forward. Interramal space narrow, fully feathered. Wings comparatively longer than in most sections, surpassing the tail when folded; pointed; but the second primary nearly as long as the first. Tail long, and much graduated; sometimes almost cuneate, usually much rounded; the rectrices quite broad to their tips. Feet of moderate size; tarsus moderately compressed, with the ordinary small subhexagonal reticulations; about as long as or a little less than the middle toe without its claw. Outer toe rather surpassing the middle; with its claw about equalling the middle and claw. Tip of inner claw reaching base of middle one. Hallux short, sessile, conical, acute, elevated. Of moderate and rather small size; bicolor, or nearly so; in youth nearly unicolor.

The genus *Æstrelata* as thus defined is quite an extensive one, comprising a larger number of species than any other of the family. In its geographical distribution, it is essentially southern and antarctic; only a very few of the eighteen or more known to compose it being found in north temperate latitudes. The numerous species all agree in certain points which separate them from others; the principal of which is the large size and great convexity of the unguis of the bill: which begins to rise almost immediately from the nasal case. Other peculiarities will be noted in the above diagnosis; which have caused the species to be put in intimate relation to each other when collocated even by those writers who recognize but one, or at most three or four genera of *Procellariinae*.

Taking the *hesitata* as the type of the genus, we find that most of the species,—*Lessoni*, *rostrata*, etc. agree entirely with it: while some others, e. g. *Cookii*, differ in being smaller and more slenderly built, with rather less 1866.]

robust bills, somewhat longer and more pointed wings, etc. These latter characters have been made typical of a distinct genus by Bonaparte. The gradation, however, in these and all other features is so gradual, through several intermediate forms, that I do not see how we are to draw the dividing line. Bonaparte moreover includes in *Cookilaria* such a species as *Solandri*, which is particularly a robust bird.

Throwing out of consideration the fuliginous "Pterodromine" group, we find that the other species of *Estrelata* adhere quite closely to a particular pattern of coloration. When adult they are dark colored above, being of some shade of brown or black, with more or less of an admixture of cinereous, and generally have a white forehead. The color of the upper parts extends on the sides of the breast; otherwise the under parts are wholly white. When young, the color of the under parts does not differ very notably as a general rule from that of the upper: the white being obscured by a dusky, fuliginous or cinereous clouding of the tips of all the feathers, the basal portions of which remain white. In general the younger the bird the more uniform, or more tending towards fuliginous are its colors: while in adult life light and dark colors occupy distinct areas, and are quite trenchantly defined.

When we consider, therefore, the great change which the plumage undergoes in the bird's progress towards maturity, together with the similarity that exists between corresponding ages, it will not appear surprising that not only very numerous nominal species should have arisen, but that names of species should have been frequently misapplied to others than those to which they rightly belong; producing a confusion in the synonymy certainly not surpassed, if indeed equalled, in any other genus in ornithology. A number of the species were first brought into notice by voyagers; and when named by professed naturalists it was at a time when the necessity of detailed descriptions was not appreciated, so that the nice points of size and proportion which really distinguish the species more than color, were rarely presented. The consequence is that it is now impossible to identify many of the older names with any degree of certainty, except perhaps by incidental or collateral testimony; and to this day a great many identifications remain matters of opinion rather than of fact.

Nor is the confusion and uncertainty by any means less in the fuliginous group which goes to compose this genus. Its components, so far as we know, are in every age unicolor; and are absolutely indistinguishable except by form and dimensions. This alone would have been amply sufficient for the production of synonyms and malidentifications innumerable; but this inevitable result is furthered by another fact. The "genus" *Pterodroma* is among the *Estrelatae* exactly what *Nectris* is among the *Puffinæ*: i. e. composed of species differing in no wise in form from *Estrelata* or *Puffinus*, and which are entirely fuliginous in color. Now the points of form separating the species of "*Pterodroma*" from "*Nectris*" are by no means patent on a casual examination; and hence, among the older writers we find many descriptions which it is impossible to refer with any degree of certainty to one or the other genus, of which, in short, we can say no more than that a fuliginous petrel formed the subject of the article. Consequently, some synonyms have ever been oscillating as to weight of authority between these two groups.

I confess to a feeling of surprise, when, on examining critically species typical of Bonaparte's genus *Pterodroma*, I could find absolutely no points of form whereby it might be held separable from *Estrelata*. I do not think that the skeleton will be found to present any tangible morphological characters. critically examined in its minutest details of intermaxillary bone or phalanges; nor do the remiges or rectrices in their relative developments offer the slightest discrepancies. We must have recourse therefore to color alone if we would separate them; and Bonaparte himself gives us no other character

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whereby we may recognize his genus. I am therefore constrained to unite the so called genus with *Æstrelata*.*

This fuliginous section, then, of *Æstrelata*, comprehends some four or five species, very widely distributed, as regards latitude; though, so far as we now know, chiefly occurring in the tropical and temperate portions of the Atlantic. A new species from Jamaica is being published as I write.†

With the exception perhaps of *A. Bulweri*, these are only distinguishable by size and some points of coloration of the feet.

This latter species differs from the type of "*Pterodroma*" in the somewhat more elongated and decidedly cuneiform tail, which is hardly contained twice in the wing from the carpal joint; and perhaps in having comparatively slightly smaller feet. The difference in the tail is no greater than that existing among unquestioned species of *Æstrelata*; and in all other points there is an absolute identity of form. This species is the type of Bonaparte's genus *Bulweria*, and by him it is placed among the *Thalassidromines*; upon what grounds I am at a loss to conjecture.‡ The "genus" seems to me to bear exactly the same relation to *Pterodroma* that *Thiellus*, Gloger, (as defined by Bonaparte to include *sphenurus* Gould, and *chlororhynchus* Lesson), does to *Nectris*.

The genus *Cookilaria*, founded by Bonaparte upon the *Pr. Cookii*, Gray, has not even an apology for characters whereon to base claims to recognition. A diagnosis is not attempted by its author; and a few weeks subsequently the name is dropped; § and *Rhantistes*|| substituted, although the species collocated under the latter designation are by no means the same as those previously included in *Cookilaria*.

The other partial synonyms quoted at the head of this article are merely instances of the reference to them of some of the species included in the genus as it is here defined and limited. Of the several names at our disposal, *Æstrelata* has, so far as I can ascertain, the priority. The species given in the following pages include all I have been able to learn of, through specimens or books, as having just claims to recognition. Very possibly some valid ones are omitted; and perhaps some now retained may hereafter help to swell the list of synonyms; that wearisome and vexatious, but inevitable, mass of rubbish, repelling inquiry, and retarding progress, under the burden of which ornithology now labors.

ÆSTRELATA HESITATA (Kuhl) Cones.

Procellaria hesitata, Kuhl. Mon. Proc. Beit. Zool., 1820, p. 142, No. 11. [Excl. synon.]—Temminck, Planches Colorées, No. 416.—Lesson, Traité Ornith. 1831, p. 611, [Excl. synon.]—Newton, Zoologist, x. 1852, p. 3691.—Schlegel. Mon. Proc. Mus. Pays-Bas, 1863, p. 13.

Æstrelata diabolica, Bonaparte, Consp. av. ii. 1835, p. 189. ex "*Procellaria diabolica*, L'Hermier."

* This procedure may seem inconsistent with the course followed in a previous paper of mine upon the *Puffins*. It is there, however, explicitly stated that the difference between *Nectris* or *Thiellus*, and *Puffinus*, is scarcely aught more than that of color, and that these genera "are hardly worth retaining, except it be for convenience's sake." (Page 117; and see also pp. 122, 128, 142, 143.) The recognition of genera founded upon fuliginous color in this family is perhaps peculiarly to be deprecated; since some species are known to pass from a fuliginous unicolor to a bicolor state of plumage with increasing age; and moreover, it is by no means incontrovertibly proven that some supposed fuliginous species are not merely immature plumages of others. I most willingly relinquish the position above referred to; and am now indisposed to degrade, even upon a plea of utility, so harmonious a group as every natural genus forms.

† *Pterodroma caribæi* Carte, P. Z. S. of which I learn through the kindness of Dr. Slater, but of whose characters I have no means of judging.

‡ The species is also included in the genus *Thalassidroma* by G. R. Gray. Examine in this connection my remarks p. 89, of the Proc. Phila. Acad. for 1864, where its affinities are shown to be with the *Æstrelatean* genus *Pterodroma*. By a lapsus calami the word "*Fulmaræ*" there appears instead of "*Æstrelatæ*."

§ Comptes Rendus, Apr., 1856., xlii. p. 708.

|| This is merely a misuse of a name of Kaup's founded in 1829 upon the *Pr. glacialis*, Linn., and therefore a synonym of *Fulmarus*, Leach, of 1825. (Steph., Shaw's Gen. Zool. 1825, xiii. p. 233.)

Procellaria meridionalis, Lawrence, Ann. Lyc. Nat. Hist., New York, iv. 1848, p. 475.—Id. Ibid. v. 1852, p. 220, pl. xv. Id. B. Amer., 1858, p. 827. [Ex *Proc. brevirostris* Lawr. olim.]

Fulmarus meridionalis, Bonaparte, Tabl. Gar. Compt. Rend., 1855. *Puffinus L'Herminieri*, Lesson, fide Bp. "Cat. Mus. Av. Rocheforte, 1843, p. 976, sp. 5958."

Procellaria rubritarsi, Gould, (nomen ined. supprimend.)

Habitat.—Atlantic ocean, coasts of America and Europe. The most boreal of the bicolor species of the genus, and the only one hitherto detected on our shores.

Form.*—The bill is about as long as the tarsus; much shorter than the skull; longer than the middle toe; very stout; but slightly higher than broad at the base; moderately compressed in the rest of its extent. The lateral lamina is very strong and large, a little inflated, short, very deep at the base. The unguis is large and strong, and its convexity begins almost from the end of the nasal case, leaving but a very brief and very concave culmen proper. The commissure is extremely sinuate, having several different curves. The unguis of the lower mandible is also strong, its point a little decurved, the gonyx convex, the angle at the symphysis acute but not very prominent. The sulcus on the side of the inferior mandibular ramus is distinctly marked. The nasal case is in length about a fourth of the culmen; broad, depressed, scarcely carinate; the orifice large, subcircular; apex a little obliquely truncated; each naris oval, with a distinct septum which reaches to the end of the case. The frontal feathers overlap the base of the bill, and descend in a nearly straight line on the sides; thence rapidly retreating backwards. The feathers on the side of the lower mandible extend much further than to a point perpendicularly beneath the furthest extension of those on the upper. The interramal space is fully feathered.

The folded wings reach a little beyond the end of the tail; the first primary is longest; the second nearly equal; the rest rapidly graduated.

The tail is very long, being contained scarcely more than twice in the length of the wing from the carpal joint. It is very cuneate in shape; the central feathers sometimes even projecting slightly beyond the rest. The difference between the median and outer pair of rectrices is fully one and a half inches.

The tarsi are moderately stout, and very regularly reticulated with small sub-hexagonal plates; largest on its interior aspect. In length it about equals the middle toe without the claw. The outer toe is a little longer than the middle; but the claw of the latter is so much longer than that of the former, as to make the tips of the two about equal to each other. The tip of the inner claw just reaches the base of the middle one. The latter is a little dilated on its inner aspect. Hallux of the usual shape.

Color.—On the crown of fully adult birds there is a vertical central area or "calotte" of blackish brown. The more mature the bird, the smaller is this spot, and the more trenchantly are its edges defined against the white which surrounds it on all sides. But in young or immature birds,—in fact, in the majority of all the specimens we examine,—this perspicuous definition of the dark area is interfered with in this wise: on the front many of the feathers are brownish black, producing a spotted or variegated appearance; and the same dark color, usually somewhat diluted in tint, extends from the crown on to the occiput, nape, and even adown the back of the neck, until it may coalesce with the color of the back. On the sides of the crown the dark color may be generally distributed, merging into the transocular fascia of dark color which always exists. This latter band of color which passes through the eye is in adult birds well defined, and quite distinct from the calotte. In all ages and plumages it is somewhat darker in tint than the crown itself.

* The description is taken from a specimen in the Philadelphia Academy; with which is also compared Mr. Lawrence's type of *Procellaria meridionalis*.

These simple facts regarding the varying extension of the dark colors of the head and neck, in a species which otherwise is not known to differ materially in plumage, have given rise to descriptions so worded as to be apparently quite in conflict with each other.

Back a nearly uniform clear bistre brown: but most of the feathers often have slightly lighter margins of an ashen hue. The shade of brown of the back deepens on the wings and wing coverts into blackish brown; which is especially intense in color on the outer webs of the primaries; their inner vanes being fuliginous brown.

The distal half of the tail is like the wings in color: the basal half is white, except the outer web of the exterior feather, and to a less extent some portions of the outer webs of the two next ones. A few of the shortest, most anterior upper tail coverts are colored like the back; the rest are white. On the sides of the flanks a few feathers are touched with brown.

The upper tail coverts; the forehead, lores, sides of head, neck,* under wing coverts, (except the row just along the edge of the wing), axillars and whole under parts are white.

Bill black; iris brown; tarsus, first joint of toes, and contained portion of webs flesh-colored; † rest of webs and toes, with claws and hallux, black.

In the young bird, the colors generally are rather darker, and tending more strongly towards smoky brown; but I have never seen a specimen entirely dark-colored below, though such a state of plumage may be found. The head and neck all around, and upper part of the breast, may be concolor with the back, as described under the young *Lessoni*.

Dimensions. Bill (chord of culmen) 1.45. Nasal tubes .33, (a little more or less). Height of bill at base .68; width .60; depth at greatest convexity of unguis .60. Wing (average) 12.00; tail 5.50 to 5.75. Tarsus 1.45: outer toe and claw 2.12; middle do., the same; inner 1.75. Gradation of tail about 1.50.

The subject of the present article bears an intimate resemblance to no other species of Petrel; and, on this account, it is the more surprising that its synonymy should have become so involved as it will be evident is the case from the succeeding remarks on its bibliography; and, particularly, it has no sort of resemblance to the *Adamastor cinereus*, to which its name of *hesitata* has been so often misapplied. Moreover, the species, so far as we know, is not subject to as great changes of plumage as many others of the genus; its general aspect, as regards color, is not that of the other congeneric species, but rather of *Puffinus major*; and why, therefore, its synonymy is so involved is a difficult matter to conjecture.

Bibliography. The first definite reference to this species which I have found is the *Proc. hesitata* of Kuhl, as above cited. The description given by this author is entirely pertinent, both as to colors and dimensions; in fact, some expressions quite exclude any other species. Dr. Kuhl also speaks of his specimen as being "in musæo Bullockiano, nunc in Temminckiano," so that, very probably—though I can by no means speak with certainty—his bird was the very individual which furnished the subject for Pl. Col. 416 of Temminck; an accurate figure now universally referred to as representing this species.

At the outset we thus have a very definite starting-point in discussing the synonyms of this species; but, most unfortunately, Dr. Kuhl adduces as synonyms of his *hesitata* two references‡ to Forster's unpublished drawings, and cites Forster as authority for the species. Whereas, neither of these drawings refer to the bird now under discussion; and the first published use of the

* Neck all around (adults); on sides only (young;) white.

† Dull yellowish in the dried state.

‡ "Forster, tab. 97;" and "tab. 98, sub nomine *Procellariæ leucocephalæ*." Mr. A. Newton, (*Zoologist*, x. p. 3696,) tells us that No. 97 is the *mollis* of Gould, called *hesitata*; No. 98, the *Lessoni* of Garnot, called *leucocephala*; and without opportunity of examining these drawings, I rely upon Mr. Newton's authority.

name *hesitata* by Forster was to indicate a very different bird;* not an *Estrelata* at all, but one of the *Puffinee*. These unfortunate citations have ever since been the cause of a sort of double employ of the name by ornithologists. The synonyms at the head of this article, taken in connection with those given under *Adamastor cinereus*, (Pr. A. N. S., 1864, p. 119,) contain most of the references of consequence which bear on the question.

One must not fail to consult in this connection Mr. A. Newton's very thorough and lucid exposition of the bibliography, as well as an accurate description, of this species, given in the "Zoologist," as above cited, on the occasion of the first introduction of the bird into the British Avifauna. Some very important corrections and verifications are there presented.

The name *hesitata* Forst. had been long in existence, in manuscript, for a species very different from the present; but being first published, (in 1820, when we first gained the right of recognizing it,) by Dr. Kuhl, for the species now under consideration, it must necessarily stand in this connection. I do not see, therefore, why Bonaparte supersedes it by *diabolica* of L'Hermier. This latter quotation, as well as the reference to a *Puffinus L'Hermieri* of Lesson, I present on the authority of Bonaparte, not having the opportunity of verifying them personally. The name "rubritarsi" of Mr. Gould is to be suppressed as unpublished by him, and, moreover, as conveying an erroneous impression regarding the color of the feet.

The *hesitata* of Lesson's *Traité*, p. 611, is this species; but the author erroneously cites *hesitata* Forst. and *leucocephala* Forst. as synonyms.

I have before me the type specimen of *Procellaria meridionalis*, kindly transmitted to me for examination by Mr. Lawrence. It is an example of *Estrelata hesitata*; as, indeed, Mr. Lawrence himself suspects may be the case. (B. N. Amer., text of p. 827.) Any differences which may exist in the specimen in question, from the figure given by Mr. Newton in the *Zoologist*, seem rather accidental than real. This same individual had been formerly called "brevirostris" by Mr. Lawrence—a name preoccupied by M. Lesson for a fuliginous species of "*Pterodroma*." Mr. Lawrence enumerates with entire accuracy the synonyms of this species under head of *Proc. meridionalis*, in the *Birds of North America*, p. 827. The name *hesitata*, as employed by Mr. Lawrence, and also by Mr. Gould, refers to the *Adamastor cinereus*, and not to the present species.

I have not met with any names or descriptions published during the eighteenth century which are definitely referrible to this species; and, if there be any other synonyms than those above commented upon, they have not been brought sufficiently into notice to require recognition in this connection. The chief point is to be able to decide, without hesitation, to what *hesitata*, as used by different authors, really refers.†

ÆSTRELATA LESSONI (Garnot) Cassin.

Procellaria Lessoni, Garnot, Ann. Sc. Nat., 1826, vii. p. 54, fig. 4, (mala.) South Pacific, Cape Horn, lat. 52°, long. 85w. Lesson, *Traité Orn.*, 1831, p. 611. Gould, B. Anst., pl. 49, (accuratissima et pulcherrima.) Reichenbach, Syst. av. tab. 24, fig. 2605; et tab. 20, fig. 339, and of authors generally.

Estrelata Lessoni, Cassin, Cat. Bds. North Pac. U. S. Expl. Exped. in Pr. A. N. S. Ph., 1862, p. 327. South Indian Ocean.

Rhantistes Lessoni, Bonaparte, Comptes Rend. xlii. 1856, p. 768.

Procellaria leucocephala, Forster, Ed. Licht. Descr. Anim., 1844, p. 206, sp.

* To wit, the *Adamastor cinereus*, ex *Proc. cinerea* Gm. Lath. Compare carefully, in this connection, my remarks, pp. 119, and 128, of the Philadelphia Academy Proceedings for 1864.

† For convenience of reference: *P. hesitata* of Kuhl, Temminck, Lesson, Newton, Schlegel, Bonaparte, and of some other authors, is the *Estrelata hesitata* of this paper. *P. hesitata* of Forster, Gould, Reichenbach, Lawrence, is the *Adamastor cinereus* of Pr. A. N. S. Ph., 1862, p. 119.

177. New Holland to Cape Horn. Gould, Am. et Mag. Nat. Hist. xiii.

1844, p. 363. From Cape of Good Hope to Van Diemen's Land.

Estrelata leucocephala, Bonap. C. A., 1856, ii. p. 189.

? *Procellaria alba*, Gmelin, S. N. i. pars ii. 1788, p. 565. Vieill. Nouv. Diet. 1817, xxvii. p. 420.

? *Daption album*, Shaw, Gen. Zool., 1825, xiii. p. 246.

? *Procellaria variegata*, Bonnærté, fide Bp.

* *Procellaria vagabunda*, Solander, Mss. fide Bp.

Habitat.—South Pacific and Indian Oceans.

Form.* Bill much shorter than the skull, but slightly less than the tarsus, about two-thirds the middle toe and claw; very robust, as broad as high at the base, compressed in the rest of its extent. Unguis of upper mandible very large, strong, deep, convex, much decurved, the tip acute; the elevation of the unguis beginning so near the nasal tubes as to leave but a short and very concave extent of culmen proper. Lateral laminae large, strong, wide, inflated, deep at the base; superior margin nearly straight, running obliquely downwards and forwards from the frontal feathers to the commissural edge of the unguis; its lower margin sharp, a little inflected, very convex in outline. The commissure is not very sinuate from the angle of the gape to the unguis. The under mandible has a very distinct and deep lateral sulcus, which is widened at both ends. The inferior unguis is large and strong, its tip much decurved and acute, its gony very concave, its angle at the symphysis prominent but not acute. The outline of the inferior mandibular rami is a little concave; the interramal space is feathered nearly to the symphysis. The nasal tubes are short, broad, somewhat depressed, their outline nearly straight and ascending a little from base to apex; the latter obliquely truncated and emarginated. The frontal feathers overlap the culmen, nearly in a straight line or with a slightly convex outline; thence immediately retreating gradually backwards as they descend the sides of the bill. Those on the lower mandible do not extend further than a point perpendicularly below those on the culmen.

The wing is of the ordinary length and shape. The tail is comparatively a little shorter and less graduated than in *hesitata*, and is contained a little more than twice in the wing from the carpal joint.

The tibiae are feathered to within half an inch of the joint. The tarsi are short, about three-fifths the middle toe and claw, moderately stout, but little compressed, with the usual small subhexagonal reticulations. The tip of the inner claw just reaches the base of the middle one. Outer toe longer than the middle; but the tip of its claw does not quite reach to the tip of the middle one. Claws all long slender, little curved, acute, compressed, the middle one somewhat dilated on its inner edge. Hallux short, slender, straight, acute, conical, sessile.

Color. Bill pure intense black. Tarsi, and basal half or more of the toes and webs flesh-colored; yellowish when dried. Rest of toes and webs, including the whole aspect of the outer toe, blackish.

The head all around and the whole under parts are pure white. But a well-defined bar of slaty or cinereous black passes through the eye. The upper tail coverts and superior surface of the tail are clouded with light grayish cinereous. On the nape the white of the head begins to be shaded with pearly gray which deepens as it descends adown the back of the neck on the interscapulars and dorsal parts generally into grayish slate; which again lightens on the rump. This color varies much as to intensity or dilution; but is never as dark as the wings. Both surfaces of the wings are deep slaty black; the greater coverts inclining to dark slaty gray: the under surface rather duller in color than the upper; the prevailing color changing gradually

* These descriptions of old and young are from specimens in the Philadelphia Academy and Smithsonian Institution.

into dull brownish gray on the edges of the inner webs of the primaries. Some of the under wing coverts are edged and tipped with grayish white. A few of the long axillars are chiefly white with their terminal portions slaty.

The preceding description is taken from a specimen from the South Indian Ocean, mentioned by Mr. Cassin in the Proceedings, as above cited. The following is from one of the specimens taken by Mr. Peale, one of the naturalists of the United States Exploring Expedition under Com. Wilkes. The specimen in question is labelled in Mr. Cassin's hand-writing "*P. Lessonii* Garnot:" and while absolutely identical in form with the species as usually known and recognized presents the following exceedingly different colors:—

Young. No. 15709, Smiths. Register. Terra del Fuego, T. R. Peale. Entire upper parts dusky fuliginous brown; the dorsal feathers usually with somewhat light margins; the color deepening on the wings and tail into brownish black. Some of the secondaries, tertials and upper coverts have a slight cinereous tinge. On the head and nape the brown is lighter than elsewhere; and a somewhat diluted shade of this color extends adown the throat, thus completely enveloping the head; and occupies likewise the upper half of the breast, quite across, as well as all the sides under the wings. On the crissum, and especially on all the under tail coverts except immediately around the anus, the color again deepens into brownish black. The rest of the under parts are white. The circumocular region is darker than the adjacent parts.

The foregoing is the most immature plumage known to me, and it will be noticed that not only the colors themselves, but the pattern of coloration is radically distinct from those of the adults. In some specimens is recognizable a faint shade of a darker color on the tips of the feathers of the otherwise white under parts; whence I infer that in very young birds the whole under parts may be brownish or grayish.

Dimensions. Chord of culmen 1.50; width or height at base .60; nasal tubes .25; from feathers on side of lower mandible to its tip 1.15; along rectus 2.00. Tarsus 1.65; middle toe and claw 2.50; outer do. 2.40; inner do. 2.10. Wing 11.50 to 12.00. Tail 5.60 to 5.50. Graduation of lateral feathers rather more than an inch.

Synonymy. Among the older authors, I only find one name—*alba*, of Gmelin and Latham—which seems at all referrible to this species. *P. alba* is evidently an *Estrelata*, of about the size of *Lessoni*, and the colors as described apply tolerably well to a somewhat immature example of this species. But there is nothing in the diagnoses of either of these authors which absolutely restricts the name to the *P. Lessoni*; and, therefore, in the uncertainty, I would by no means supersede M. Garnot's appellation *Lessoni*, the description of which is quite pertinent. I believe Mr. Cassin, in the Proceedings of the Philadelphia Academy, as above, was the first to refer the bird to its proper genus.

The *Procellaria leucocephala* of Forster is certainly this species. His description is in every respect pertinent to the adult bird. Although the name had been used, in manuscript, as applied to Drawing No. 98, for many years, it was not published until 1844, and, consequently is antedated by *Lessoni* of Garnot, (1826). Forster's editor, Dr. Lichtenstein, says, probably correctly, that *leucocephala* Forst. is the *alba* Gm.; but certainly incorrectly that "vix nisi ætate differre videtur a *Proc. hesitata* Forst.;" whereas *hesitata* Forst. is not even congeneric with *leuc cephalus*.

I am unable to discuss the synonyms *variegata*, Bonnærté, and *vagabunda* Solander, which I quote on the authority of Bonaparte.

ÆSTRELATA ROSTRATA (Peale) Gray.

Procellaria rostrata, Peale, Zool. U. S. Expl. Exped. 1848, p. 296. Cassin, Ornith. U. S. Expl. Exped. 1858, p. 412.

Rhantistes rostrata, Bp., Compt. Rend. 1856, xlii. p. 768.

[May,

Procellaria (Æstrelata) rostrata, G. R. Gray, Cat. Bds. Pacif. Isl. 1859, p. 56.

Habitat.—Tahiti. (Peale.)

The following detailed description of this little known and hardly recognized species is taken from Mr. Peale's type specimen, now before me.

Form.—The bill is much shorter than the head or tarsus, about two-thirds the middle toe without its claw; exceedingly robust, especially at the base where it is as high as broad, and where its height is nearly equal to half the length of the culmen. The lateral laminae of the upper mandible are very wide and large; especially basally, where their upper margins rise so high as to be nearly on a level with the dorsum of the nasal case, the tubes being thus almost buried between the laminae. In consequence of this shape of the lateral laminae the sulcus is extremely sinuate, extending from the top of the root of the nasal case to the commissural edge of the unguis, near its middle. The inferior edge of the laminae, forming in great part the cutting edge of the upper mandible, is decidedly convex in outline. The unguis is large and strong, and its elevation, which begins almost directly from the termination of the nasal case, as well as its convexity and decurvation, are very great. The under mandible is straight, its sulcus strongly pronounced, its tip decurved and acute, its unguis large, its gonys quite concave, though there is but a slight protuberance at the symphysis.

The nasal tube is short, wide, depressed, turgid, not carinated, convex in outline both antero-posteriorly and transversely; its apex obliquely truncated, broad, depressed, not emarginated, the nares circular, separated from each other by a rather thick septum which comes forward to the very end of the nasal case. The frontal feathers encroach far upon the dorsum of the tubes, with a rounded termination, and then slope gradually backwards and downwards.* The feathers on the sides of the lower mandible do not extend to a point perpendicularly below the apex of the frontal feathers.

The wings are long, the first primary considerably surpassing the second; and when folded they reach considerably beyond the end of the tail. The latter is of moderate length, contained rather more than twice in the length of the wing from the carpus; and it is much graduated in shape.

The feet are comparatively large for the size of the bird, absolutely about equalling those of *Lessoni*, which is a larger bird. The relative proportions of the tarsus and toes are much the same as in other species. The hallux is rather long, slender and acute.

Dimensions.—Length about 14 inches, "extent 39.50," (Peale.) Wing 11; tail 4.75; bill along chord of culmen 1.37; height or width at base .66; nasal tubes .25; from feathers on side of lower mandible to its tip 1.20. Tarsus 1.75; middle toe and claw 2.25, outer do. 2.12; inner do. 1.80; hallux .25. From apex of longest secondary to tip of longest primary in the closed wing 3.25.

Color.—Entire upper parts pure deep blackish brown, including the under surfaces of the wings and tail feathers; everywhere of a nearly uniform tint; but a little darkest on the outer webs and tips of the primaries, and somewhat lighter on their inner webs, especially towards their bases. This color of the upper parts extends around the sides of the head, neck and breast; but becomes on the chin, throat and breast a little paler; and includes the sides under the wings, and crissum. Rest of under parts, including the under tail coverts, pure white; the latter however have a few isolated brownish streaks. The line of demarcation between the dark and light colors on the breast is not very trenchant. The bill is black. The tarsi are pale yellow; probably flesh colored in life. A small space on the lower part of their external aspect, and the whole toes and webs (except a small yellow spot on the inner web near its base) are black.

This color of the upper parts is a pure very dark brown, with no mixture

* This outline of the feathers on the bill shows an approach to that seen in *Pagodroma*, and is quite different from anything that obtains in the other species of the genus *Æstrelata*.

whatever of ashen, gray or plumbeous. The distribution of colors is almost exactly that of the species of *Cataractes*.

I do not think that the plumage above given is that of the adult; it so closely resembles that of the immature *E. Lessoni*, which is its nearest ally. It is the only one, however, of which we have at present any knowledge.

I think it most probable that this is a valid species. There is none to which it bears any very intimate resemblance, except *E. incerta* and *E. Lessoni*. The relationships of the former will be noticed elsewhere. Compared with a young *E. Lessoni*, in which the size and pattern of coloration are not widely diverse, I find them to differ as follows: The upper parts of *rostrata* are of a deeper, purer brown. The under tail coverts are almost wholly white; those of *Lessoni* wholly dark colored except immediately about the anus. *Rostrata* is a smaller bird, the wing being an inch, the tail rather more than an inch shorter; but the feet are absolutely of the same size, and therefore comparatively larger. The bills of the two birds are nearly of the same length; but the radical difference in the character of the nasal tubes, the degree of turpidity of the base, and the outline of the feathers, as will be evident on comparing the descriptions given, at once distinguish them.

It is quite possible that some of the indications of older authors may have reference to this species; but in the utter impossibility of establishing any such with certainty I think it best to assign no synonym whatever.

ÆSTRELATA PARVIROSTRIS (Peale) Cones.

Procellaria parvirostris, Peale, Zool. U. S. Expl. Exp. 1848, p. 298. Cassin, Ornith. U. S. Expl. Exped. 1858, p. 411. G. R. Gray, Cat. Birds Pacif. Isl. 1859, p. 56.

Rhantistes parvirostris, Bp. C. R. 1856, lxii. p. 768.

Habitat.—Honden Island.

As in the case of *E. rostrata* I describe this supposed species from Mr. Peale's type specimen.

Form.—Bill much shorter than the head, but very little less than the tarsus, about two-thirds the middle toe: slender, compressed, considerably higher than broad at the base; its lateral outline about straight. Nasal tubes much as in *mollis*.* A considerable concavity of culmen between the nares and the elevation of the unguis; which latter does not rise very high, but is nevertheless very convex; much denuded, attenuated and hooked. Sclerous on side of the upper mandible curved, its convexity looking downwards, and greatest near the base of the bill, where the lateral laminae rise high up to embrace the roots of the nasal case. Commissural edge of upper mandible strongly sinuated. Lower mandible almost exactly as in *mollis*; perhaps a trifle slenderer. Outline of feathers on base of bill just as in *mollis*.

The wings are exceedingly long, when folded much surpassing the tail. First and second primaries about equal and longest. Tail of moderate length, contained about $2\frac{1}{2}$ times in the wing. It is greatly graduated, the difference between the external and median rectrices being 1.25 inches.

The tibiae are denuded for nearly half an inch. The plates on both sides of the tarsus are small, irregular and very numerous. The tarsus is a little more than three-fourths as long as the middle toe and claw. The usual proportionate lengths of the toes prevail. The claws are all small, weak and little curved. The hallux is minute, straight, not very acute.

Dimensions.—"Fourteen inches long, by 36 in extent," (Peale.) Wing 11; tail 4.50; tarsus 1.25; bill 1.08; outer toe and claw 1.66. From tip of longest secondaries to end of primaries 4.25. Gradation of tail 1.25.

Colors.—Entire upper parts, including both surfaces of the wings and tail, deep fuliginous brown, (with no trace of ashy or plumbeous) becoming almost black on the outer webs of the primaries, and inclining to grayish fuliginous

*The tubes of the single specimen have been so injured by pressure or otherwise that they cannot now be accurately described.

on their inner webs and towards their bases. The head, neck and breast all round are like the back, but not quite so intense in color; and the dark tint only occupies the extreme tips of the feathers; while its continuity is also interrupted by some whitish spots that show at intervals. There is no distinct line of demarcation between the dark color of the breast, and the pure white which occupies every other portion of the under parts of the bird, with the exception of a few dark brown isolated feathers along the sides under the wings and the crissum, and some streaks on the outer margins of the external under tail coverts. The bill is black; the tarsi, first digital phalanges, and included portions of interdigital membranes, are dull yellowish, but were probably flesh colored in life. The rest of the webs and toes are black.

ÆSTRELATA INCERTA (Schl.) Coues.

Procellaria incerta, Schlegel, Mon. *Proc. Mus. Pays-Bas*, 1863, p. 9.

"Wing 11 inches 5 lines; point of the wing 3 inches 9 lines. Tail: middle feathers 4 inches 10 lines; external feathers 3 inches and 3 to 5 lines. Bill: length 16 lines to 17 lines and a half; height 5 lines to 5 lines and a half. Width 6 lines to 6 lines and a half. Length of nasal tube 3 lines and a half. Tarsus 18 lines and a half. Middle toe 1 inch and 10 to 11 lines. Feet yellowish, becoming black upon the two last or the last joints of the toes, with the contained membrane. Head, neck and back brownish gray, clearer and inclining to whitish on the throat or whole under part of the neck. Back, wings and tail blackish brown. Below from the breast, white, mixed with brown on the flanks and becoming brown on the under tail coverts."

Habitat.—"Southern Oceans, New Zealand, Australia, New Caledonia." [Schlegel.]

The above is a copy of Dr. Schlegel's description of this supposed species, of which the author further says: "I have not been able to refer this species to any one hitherto described. It appears allied to the *Proc. rostrata*, Peale, * * but has the under tail coverts dark colored instead of white, and its colors generally are less brownish." It is to be deplored, that in introducing a species into so difficult a family as the present one, a more detailed description was not given.

As well as I can judge by the description, the species is about the size of *P. rostrata*, but distinguished from the latter by the different color of the under tail coverts, and a less decidedly brown tinge of the upper parts generally. It is probable also that if the bill possessed the turgidity which characterizes that of *rostrata*, together with the peculiar outline of the frontal feathers, these points would not have escaped the attention of Dr. Schlegel. The bird may pretty safely, then, be separated from *rostrata*.

I think that it is to the immature plumage of *Æstrelata Lessoni* that the species is to be referred, if it be really not valid. There were no recognized specimens of this latter species in the Museum of the Pays-Bas when *incerta* was founded. It comes in all respects exceedingly near the plumage I describe above as that of the young *Lessoni*; so much so that I fail to detect material discrepancies. Still I should not like to reduce any species founded by a competent naturalist, except by autopsy; and therefore leave it as described by its author; only desiring to call attention to the necessity of careful comparison with the plumage of the young *Lessoni*.

ÆSTRELATA NEGLECTA (Schl.) Coues.

Procellaria neglecta, Schlegel, Mon. *Proc. Mus. Pays-Bas*, 1863, p. 10.

"Colors of the plumage and of the feet as in *P. incerta*. But much smaller in size and with the shafts of the quill feathers whitish. Wing 10 inches and 6 to 11 lines; point of the wing 4 inches and 1 to 10 lines. Tail 3 inches and 8 to 11 lines. Bill: length 13 lines and a half; height 4 to 5 lines; width 5 lines and a half to 6 lines and a half. Length of nasal tubes a little over 2 lines. Tarsus 17 lines to 17 and a half. Middle toe 19 lines to 19 and a half." 1863.]

Habitat.—"Pacific Ocean. Kermadec Islands. Sunday Island." [Schlegel.]

I can offer no opinion concerning this supposed species, except to state that it may possibly be, as Dr. Schlegel himself seems inclined to suspect, the *Æstrelata parvirostris*. But this latter species itself is so very near *mollis* Gould, that it may hereafter prove to be only a state of plumage of the latter.

ÆSTRELATA SOLANDRI (Gould) Coes.

Procellaria Solandri, Gould, P. Z. S., March 26, 1844, p. 57. Gould, Ann. and Mag. N. H. xiii. 1844, p. 363. Gould, Introd. Birds Aust. 1848. p. 116.

Cookilaria Solandri, Bonaparte, C. A. 1855, ii. p. 190.

Procellaria melanopus, Natterer, *fid*e Gould. (Not of Gmelin.)

"Head, back of the neck, shoulders, primaries and tail dark brown; back, wing coverts and upper tail coverts slate-gray, each feather margined with dark brown; face and all the under surface brown, washed with gray on the abdomen; bill, tarsi, and membranes black.

"Total length 16 inches; bill $1\frac{3}{4}$; wing 12; tail $5\frac{1}{2}$; tarsi $\frac{3}{4}$; middle toe and nail $2\frac{3}{8}$."

The preceding is a copy of Mr. Gould's description of this species. This author further says of it. "This is a remarkably robust and compact bird. I shot a single individual in Bass' Straits, on the 13th of March 1839. M. Natterer thought that it might possibly be identical with the bird figured in Banks' drawings, and to which Dr. Solander has affixed the term *melanopus*, an opinion in which I cannot concur. I have accordingly named it in honor of that celebrated botanist. The specimen above described may possibly prove to be not fully adult, as the dark coloring of the under surface only occupies the extreme tips of the feathers—the basal portions of which are snow-white."

I have not enjoyed an opportunity of examining a specimen of this species, and none, so far as I am aware, are contained in any American collection. It appears to be exceedingly distinct from any other species of *Æstrelata*, if not in colors at least in proportions of bill and feet, as compared with the absolute size of the bird. The dimensions of these parts as given by Mr. Gould,—particularly the shortness of the tarsi, as compared with the lengths of the toes, are quite different from that of any other species of the genus; so much so that the bird may not be a true *Æstrelata*; upon which point however I cannot now give a definite opinion. The type of the species is doubtless, as Mr. Gould surmises, not fully adult; and when mature the dark coloring of the under parts will in all probability disappear, leaving the whole inferior regions of the body white. The unicolor pattern of the feet is diverse from the ordinary style which prevails in nearly all the species of the genus.

By Bonaparte the species is referred to his "genus" *Cookilaria*, though for what reason is not obvious, since Mr. Gould particularly notes that his species is a "remarkably robust and compact bird," while the type of "*Cookilaria*" is the *leucoptera* Gould; almost the very smallest and most gracefully formed species of *Æstrelata*. Dr. Schlegel's identification of *Solandri* with *grisea* of Kuhl is elsewhere commented upon.

ÆSTRELATA GRISEA (Kuhl) Coes.

Procellaria grisea, Kuhl, Mon. Proc. Beist. Zool. 1820, p. 144, No. 15. fig. 9.

But not of Latham.* Schlegel. Mon. Proc. Mus. Pays-Bas. 1863, p. 12; (excluding synonymy)

*Lath. Syn. 1785. iii. part ii. p. 399, No. 4. "Size of a jack-daw; length 14 or 15 inches. Bill 2 inches long, and brown; the whole plumage black or sooty; the under wing coverts white, with black shafts; the wings rather exceed the tail in length; the forepart of the legs greenish blue. The specimen in the Leverian Museum has the chin and throat of a whitish color. Inhabits the southern hemisphere from 35° to 50°. Seems much allied to the Black Petrel," (*capinotialis*.)

This is a species of Latham's which has not so far as I am aware been identified by later writers; and I find it quite impossible, from the above meagre indication, to come to any definite conclusion regarding it. It is, however, in all probability some species of *Nectris*, of the *Puffineæ*; so that we need not therefore be prevented from using Kuhl's name of *grisea* for a bird of the genus *Æstrelata*.

Procellaria lugens, Forster, icon. 21, according to Kuhl. Banks, tab. 21 and 22, "ubi rostri forma optime est delineata" according to Kuhl.

"*Æstrelata inexpectata*, Forster," of Bonaparte's Conspectus, ii. p. 189. But not the true *inexpectata* of Forster which is doubtless *mollis*, Gould.

"Bill much compressed. Plumage uniform gray, darkest above, and becoming blackish on the wings. Generally similar to *mollis* of Gould, but with a more compressed bill, different colors and proportions of some parts, and the feet, including the webs, brownish in the dried state. Wing 9 1-12th inches; central tail feathers 3 11-12ths, external ones 2 11-12ths. Bill 11½ lines long: 4 high, 4½ wide. Length of nasal tube rather more than 2 lines. Tarsus 16½ lines. Middle toe 19 lines."

The preceding description is compiled from the diagnosis of a species given by Dr. Schlegel (as above cited) from the Australian seas. That writer identifies it with the *grisea* of Kuhl, and gives *Solandri* of Gould as a synonym. I am unacquainted, autoptically, with any species differing from *mollis* Gould, by the characters as given by Dr. Schlegel. That gentleman, however, has a specimen indicating such a species, and upon the competent authority of the accomplished Director of the Pays-Bas Museum, I recognize the species as distinct from *mollis*. The color of the plumage I do not think can be regarded as a constant and valid character, since some ages of *mollis* present exactly the tints described as those of *grisea*. The species must therefore be separated, if at all, by the more compressed bill, different colors of the feet, and different proportions of some of the parts. Taking Dr. Schlegel's description and specimen as the only tangible basis on which the supposed species I am now treating of rests, there are presented for our consideration the following points of synonymy.

Attentive study of Kuhl's description of the bird he calls "*grisea* L.," and examination of his figure (fig. 9) will show clearly that it is by no means the species described by Latham under the name of "Gray Petrel, *P. grisea*." Latham gives the bill as two inches long, while Kuhl's figure delineates a bill measuring just one inch along the chord of the culmen. Other discrepancies are palpable throughout. Latham's *grisea* appears to be a *Nectris*, while Kuhl's is an *Æstrelata* very near *mollis*. Kuhl himself takes occasion to note some discrepancies between his bird and Latham's.* Kuhl's expressions "rostro valde compresso; * * corpore et tectricibus alarum inferioribus cinerascens fuliginosis, pedibus pallidis" together with his measurements, are entirely pertinent to the bird whose characters are given by Dr. Schlegel; so that the only question is the distinctness of the species from *mollis*.

While I thus entirely agree with Dr. Schlegel in this identification of Kuhl's name, I can by no means assent to the referring of Mr. Gould's *P. Solandri* to this species. *P. Solandri* is certainly radically distinct; and so different in its proportions that I cannot understand how Dr. Schlegel could have reconciled it with *P. grisea*.

Dr. Kuhl (l. c.) says of the *P. lugens* of Forster (ic. 21) that he considers it the same as *grisea*; he also adduces *P. lugens* Banks, (tab. 21 and 22,) as a synonym of the latter. My quotation of these names is entirely upon Dr. Kuhl's authority.

The *Æstrelata inexpectata* of Bonaparte's Conspectus evidently belongs here rather than to the true *mollis*. The author quotes Kuhl's *grisea* as a synonym; and the diagnosis he gives presents nothing incompatible with the present species. The true *inexpectata* of Forster is, I think, *mollis*, as I attempt elsewhere to demonstrate.

As a summary of the preceding remarks I may state that if there be a spe-

* "In exemplari meo haud observari quod Lath. de inferioribus alarum tectricibus dicit."—Kuhl, p. 144.

cies of *Æstrelata*, closely allied to *mollis* but permanently differing from it by those characters laid down by Dr. Schlegel, and of which the specimen in the Museum of the Pays-Bas is an example, then the synonyms adduced at the head of this article are most properly to be referred to this species; but otherwise they must be considered as appertaining to *mollis*.

ÆSTRELATA MOLLIS (Gould) Coues.

? *Procellaria melanopus*,* Gm. S. N. i. p. 562. Lath. Syn. iii. p. 409, No. 12. Vieill. Nouv. Diet. xxvi. 1817, p. 420. ? *Puffinus melanopus* Steph. Zool. xiii. p. 231.

Procellaria inexpectata, Forster, Deser. Anim. ed Licht. 1844, p. 204, No. 177. Not *Æstrelata inexpectata* of Bp. Consp. which rather appertains to the "*grisea* Kuhl" of this paper.

Procellaria mollis, Gould, Ann. et Mag. N. H. 1844, xiii. p. 363. Id. Birds Aust. vii. pl. 50. Cassin U. S. Ex. Exped. Ornith. 1858, 410. Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 11.—And of later authors generally.

Cookilaria mollis, Bonaparte, C. A. 1855, ii. p. 190.

Rhantistes mollis, Bonaparte, Comptes Rendus, xlii. 1856, p. 768.

? *Procellaria gularis*,† Peale, Zool. U. S. Expl. Exped. 1848, p. 299.

? *Procellaria Phillipii*, G. R. Gray, Ibis, 1862, iv. p. 246.

? *P. crepidata*; *P. sandaliata*, Solander, according to Bp.

Habitat.—South Pacific and Antarctic Oceans.

Form.‡ Bill as long or slightly less than the tarsus, nearly equal to the middle toe without its claw; compressed, a little higher than broad at the base. In the details of its shape it does not differ from the typical species of *Æstrelata*. The proportions of tarsus and toes are also as in other species of the genus. The tail is only moderately rounded, instead of being decidedly cuneate with some projection of the median rectrices, as in *Æ. hesitata*; its length is contained in that of the wing from the carpal joint slightly more than twice. The folded wings reach considerably beyond the tail. The species in size and general contour of the body approaches *Daption capensis*.

I do not notice that the plumage is softer, fuller, or more mollipilose than in some other species of the genus.

Color. There is a transocular black fascia, the greater part of which lies below the eye. The clear ashy gray of the upper parts extends over the vertex, becoming more or less mixed with white on the front and cheeks, according to age. Most of the feathers of the back have slightly paler margins. The primaries are nearly concolor in all their extent; (compare description of No. 15,706 Smithsonian Collection, *infra*;) being only a little duller or more fuliginous on their inner webs. The under surface of the wing is chiefly dusky brownish; but there is an illy-defined and interrupted area of whitish, particularly towards the bases of the primaries. The upper tail coverts and tail are chiefly concolor with the back; but some of the outer rectrices are marbled with white.

In the majority of specimens the color of the back extends on the sides of the breast for a considerable distance; sometimes quite across the middle: but in very adult birds most of the breast is pure white. The color is produced by a clouding of the tips only of the feathers, their basal portions be-

* The following is Gmelin's diagnosis: "13 pollices longa. Vertex, cauda rotundata, et alae totæ obscuræ nigrae; dorsum ex atro paulisper canescens; membrana digitos connectens parte sui ulteriore, digitorumque articuli nigri."

† *I eade*, as above. "Above cinereous brown; tail and breast plumbeous; throat, under wing coverts and under tail coverts white. Primaries and spurious quills nearly black with brown shafts; tail light beneath: two outer feathers mottled with white, * * * whole under plumage white at the roots; bill blue-black. Length 13; extent 34; wing from carpal joint 10½; bill one inch; tarsi 1-20; outer toe 1-60; tail 3-40."

‡ Description from typical examples, received from Mr. Gould, in the Philadelphia Academy.

ing white; and often is not uniform in tint, but is minutely undulated or punctulated with lighter and darker shades.

The front, lores, lower part of cheeks, and whole under parts, including the lower tail coverts, are white. The lateral rectrices are on their inferior aspect chiefly white, with some light cinereous marbling.

In general terms it may be stated that the older the bird, the clearer and purer is the cinereous, and the more trenchantly defined are the boundaries of the several differently colored areas; the difference in this respect being especially notable in the forehead and sides of the breast.

Young birds are all over of a pretty uniform deep brownish ash, or fuliginous cinereous; inclining to smoky brown on the wings and tail. The whole under parts are not notably different from the back, though, however, the dark color only occupies the tips of the feathers; their basal moiety remaining white. The transocular dark fascia is always present. But the chin and face are much mottled with whitish; and in specimens otherwise wholly dark on the under parts, the chin and throat may be chiefly white, striatulated with ashy brown.

Moulting specimens, or those in poor plumage from the age and worn condition of the feathers, show scarcely a trace of cinereous on the wings and tail, these parts being of a dull brownish, more or less tending to gray. The same tendency to brownish or grayish instead of cinereous is observable on other parts. Sometimes a pure white chin and throat coexists with complete dusky clouding of the other under parts.*

The bill and feet hardly differ in color with age. The bill is black; the tarsus, basal half of inner toe and contained web, flesh colored; (dull yellowish when dry;) all the rest of the toes and webs, with all the claws, black.

Dimensions. (No. 1678, Phila. Acad., J. Gould.) Bill (chord of culmen) 1.10. Height at base .45; width slightly less. Tarsus 1.33. Outer toe and claw 1.75; middle about the same, inner 1.50. Wing average 10.00; but may range from 9.50 to 10.50; tail 4.50; the graduation of the rectrices about 1.30. These are nearly the average dimensions of six examples.

There is a specimen, No. 15,706, in the Smithsonian Museum from the Antarctic Ocean, by Mr. T. R. Peale, which, with the size and general appearance of *mollis* differs as follows: The under surfaces of the wings are, except just along the edges, purely and uninterruptedly white; as much so as in *C. okii*. The inner vanes of all the primaries, instead of being simply duller and grayer than the outer, have trenchantly defined pure white areas; these white spaces occupy the whole of the webs at the base; as they extend more towards the apex they become less wide, leaving a narrow space of dark color along the inside of the shafts; apically they terminate with an acutely pointed outline, which stretches towards the tip of the feather, and is bounded internally and externally by dark colored portions of the feather. The general pattern is exactly that seen in the primaries of most *Lari*; and the definition of the two colored areas is as strict. In other respects the bird is like a quite young *mollis*, being dark colored both above and below; but the tint of the clouding below is more intensely sooty than in any specimen of typical *mollis* I have seen; and there is this peculiarity in addition, that the under tail coverts remain pure white.

I do not wish to introduce a new name upon the above basis; though possibly in any other family than the very one of the Petrels I would do so. The points which would constitute its specific characters are elucidated in the preceding paragraph; and should the differences above pointed out be substantiated as persistent in other specimens, it would, I think, then be proper for the ornithologist who makes the verification to formally introduce the species. The specimen in question before me is the only one contained in the United

* In which condition is the type of "*gularis*," Peale,

States Wilkes' Exploring Expedition collection; and is, therefore, in all probability, the very individual upon which Mr. Peale based his description of *gularis*; which name should, therefore, stand for the species, in the event of its proving valid; even though Peale's description does not notice the peculiar markings of the primaries.

Bibliography. It is possible that the *P. melanopus* of Gmelin and Latham was based upon this species. Their bird evidently was an *Æstrelata*, and "thirteen inches long;" and the description of the colors would apply pretty well to an immature *mollis*. But *mollis* has a bill by no means an inch and a half long; and is not found, so far as we know, "circa Americani septentrionalis." The only known North American species of *Æstrelata* is the *hesitata*; of which the bill is nearly of the length stated by Latham. Under the circumstances, I do not think this name is to be adopted for either species.

I think there can be no doubt that the *inexpectata* of Forster is really this species. I find no points of the description, nor any of the measurements, at all incompatible with this supposition. Dr. Lichtenstein refers *inexpectata* to *grisea* of Gmelin; certainly incorrectly, whatever may be its relations to *grisea* of Kuhl.

The name *mollis* Gould bears the same date of publication as *inexpectata*, (1844): so that it is difficult to say which actually has priority. I think, if any choice is allowed us, we should, by all means, use *mollis*, so definitely characterized and well known. Mr. Gould, in describing the species, says that it had been identified with *lugens* of Banks, and with *grisea* of Kuhl (nec Gm.) This may very possibly be the case; although, for the present, I give *grisea* Kuhl, (of which *lugens* Banks is a synonym,) as a distinct species, for reasons stated elsewhere.

In the Ibis, as above, Mr. G. R. Gray has a species *P. Phillipii* from Norfolk Island; based upon the "Norfolk Island Petrel," Phill. Bot. Bay, p. 161; with *P. alba*, var. Lath., and *P. mollis* Gould, as synonyms, the latter queried. No description is given, and I merely follow Gray himself, in placing the name as a queried synonym of *mollis*. Vieillot, (Nouv. Dict., xxvi. 1817, p. 420,) refers to this same "Norfolk Island Petrel."

ÆSTRELATA COOKII (Gray) Coues.

Procellaria Cookii, G. R. Gray, Fn. N. Z. App. Dieff. Trav., 1843, ii. p. 199.—Id. Voy. Eréb. and Terror, pt. iii. 1844, pl. 35.—Id. Scater's Ibis, 1862, iv. p. 246. Cassin, U. S. Expl. Exped. Ornith., 1858, p. 424, and of authors.

Rhantistes Cookii, Bonap. Compt. Rend. xlii. p. 768.

Procellaria leucoptera, Gould, P. Z. S. xxii. 1844, p. 57.—Id. Ann. Mag. N. H. xiii. 1844, p. 364.—Id. Birds Aust. pl. 51.

Cookilaria leucoptera, Bonap. C. A. 1855, ii. p. 190.

Cookilaria velox, Bonap. C. A., 1855, ii. p. 190, ex *Pr. velox* of Solander. Not *velox* of Banks, supposed to be one of the *Pr. onææ*.

Rhantistes velox, Bonaparte, Compt. Rend. xlii. 1856, p. 768.

Procellaria brevipes,* Peale, Zool. U. S. Ex. Ex. Bds., 1848, p. 294.

Habitat.—Southern Oceans, at large.

Form.† Bill much compressed, except at the extreme base, where it is nearly as wide as high; much shorter than the skull; about equal to the tarsus; one of the most slender in general shape of this genus. The lateral superior sulcus is nearly straight, being only a little sinuate; the outline of the inferior mandibular rami and of the gonyes both a little concave, the pro-

* Peale, as above. "Head and wings sooty black; tail and back gray; throat, breast, and belly white, tinged with salmon color when living; interrupted plumbeous band across the breast; two outer tail feathers light gray, white beneath; shafts white; all the others brown; under wing coverts white; lesser ones nearly black. Bill black; feet pale flesh; toes black at their ends. Length 10.70; extent 24.25; culmen nineteen-twentieths; middle toe and claw 1.30."

† From specs. in Philada. Acad. and Mus. Smithsonian.

tubercle at the symphysis acute, if not very prominent. The commissure is, as usual, very sinuate. The nasal case is contained nearly four times in the length of the culmen; broad, depressed, its dorsal outline straight, its apex very obliquely truncated, its orifice subcircular, each naris oval; the septum of considerable thickness, and coming forward to the very end of the case. The frontal feathers do not extend at all forward on the base of the culmen, but embrace the sides of the bill as extensively as they do its base above; and thence they slope very rapidly backwards, making a considerable angle just above the edge of the commissure.

The wings are sufficiently elongated to extend, when folded, a little beyond the end of the tail, which is, itself, rather longer than in most species of this group. The second primary is nearly as long as the first; the rest are rapidly graduated.

The tail is so long as to be only contained exactly twice in the length of the wing from the carpus, and the graduation of the lateral feathers is about as great as in *hesitata*, (greater than in *mollis*,) though the median pair of rectrices are not specially produced. The upper tail coverts fall far short of the end of the tail: the under ones reach quite to it.

The legs are short and slender; the tibiae bare for but a very brief space. The tarsi are considerably shorter than the middle toe without its claw, and about equal to the inner; quite slender, moderately compressed, with the ordinary reticulations. The tip of the inner lateral claw just reaches the base of the middle one. The middle and outer toes are of equal length, but the claw of the latter is much shorter than that of the former: which last is but very slightly dilated on its inner edge. All the claws are small, slender and weak, but still much curved and acute. The hallux is of the ordinary size and shape.

Dimensions. Chord of culmen 1.00; height of bill at base .35 to .40. Length of nasal case .25. Wing 8.50 to 9.00; the distance from end of longest secondary to tip of first primary in the folded wing 2.75. Tail 3.75 to 4.25; graduation 1.00 to 1.50. Tarsus 1.10; outer toe and claw 1.25; inner do. 1.12, middle do. 1.33. From upper tail coverts to end of tail 1.40.

Color. Adult. Above blackish cinereous. On the crown of the head and its sides to a little below and before the eye, and on the nape the color tends more towards sooty brownish than to cinereous; but on the neck behind this color merges insensibly into the quite pure deep cinereous, which occupies the middle dorsal region, the interscapulars, and some of the tertials. The rump is darker and more like the crown; the upper tail coverts again being cinereous, if anything a little lighter than the back—tending to pure grayish instead of dusky cinereous. The superior surface of the tail is plumbeous blackish, lightest and most cinereous basally. Inferiorly the tail is lighter colored than on its upper surface; the lateral rectrices particularly being light plumbeous gray, almost whitish basally. The shafts of the feathers are above brown, below white, except at their extremities. The superior wing coverts and all the primaries and secondaries are brownish or fuliginous black; deepest along the edges of the wings, and outer borders and tips of the quill feathers. The inner vanes of the primaries are light grayish fuliginous, becoming grayish white towards their bases; but the transition is quite gradual. The shafts are black above, brownish beneath. All the under wing coverts are pure white, except one row, the smallest, just along the edge of the ulna and metacarpus; producing a broad uninterrupted white area. On the radial edge of the antibrachium there is a narrow but well-defined white line:* visible from both upper and under aspects of the

* This is very erroneously called a "*linea humeralis*" by Mr. Gould in one place; and spoken of as "a line along the inner edge of the *shoulder*" in another. We very often find the carpal joint most carelessly and incorrectly spoken of as the "*shoulder*."

wing. The front, the lores, the sides of the head nearly to the eyes; the side of the neck, and the whole under plumage, pure white. The color of the back almost always, to some degree, clouds the sides of the breast.

The above is the plumage of a very mature bird. Usually the plumage is rather as follows. The upper parts generally are less decidedly cinereous—having more of an admixture of brownish—though the upper tail coverts are quite notably plumbeous. The forehead is speckled with black: sometimes the latter color being in excess over the white. The sides of the breast are very strongly clouded with dark cinereous gray, which may reach quite to the median line; though this color is only a wash on the extremities of the feathers. Some of the feathers on the flanks, and a few of the under tail coverts are also lightly touched with plumbeous gray.

Young. The upper parts show scarcely a trace of cinereous anywhere, except, perhaps, on the upper tail coverts. The front is so much obscured by dusky that the white only appears in small sparse specks. The whole under parts are tinged with a plumbeous black hue from the breast backwards; this color being deepest on the breast where it is pure and uninterrupted; on other parts appearing as a clouding or marbling. The chin and throat in all the specimens I have seen remain almost pure white, in marked contrast to the rest of the under parts. The under wing coverts are as described in the adult: and the white line along the edge of the fore arm also exists.

It will be noted that the changes of plumage above described are quite homologous with those to which *mollis* is subject.

The bill is black. Slightly more than half the inner web, and rather less than half the outer web, together with the tarsus, are light flesh color. The rest of the toes and webs are black. The colors of the bill and feet seem subject to little variation with age.

Synonymy. The name *Cookii* of Gray has priority by about a year over *leucoptera* of Gould; as, indeed, the latter author himself allows. That these two names were based upon the same species is not doubted, so far as I can learn, except by one author. Bonaparte would have it that the bird figured in plate 51 of the Birds of Australia, and called "*Cookii* Gray" by Mr. Gould, is not the species really so named by Mr. Gray; but another; differing slightly in size, though quite identical in color, and for which he adopts the name *velox*. In this conclusion, he is quite unsustained by ornithologists.

The specimen collected by Mr. T. R. Peale, now before me, which doubtless is the type of his *breripes* of 1848, is an example of this species.

This little species is liable to be confounded with no other, except, perhaps, the succeeding one; under the head of which latter the apparent differences are noticed. I find no names of the older writers which seem referrible to this species; and its synonymy is less confused than that of most other components of the genus.

ÆSTRELATA GAVIA (Forst.)

Procellaria gavia, Forst. Descr. Anim. Ed. Licht., 1844, p. 148. ("P. suprà cœrulescenti-nigra, subtus candida, palato et linguâ villis deflexis, pedibus pallide-fuscis. * * Habitat ad Æstuarium Regiæ Charlottæ. * * Corpus magnitudine circiter *P. vittatæ*. * * Alae expansæ 26 unc. rostrum in fronte 1.50; tibiæ 1.75; cauda 2.50." Forst.) G. R. Gray, Voy. Ereb. and Terr. Birds, pt. x. Oct., 1845, p. 18.—Id. Ibis, 1862, iv. p. 246. From Queen Charlotte's Sound.

This is a species which is not recognized, and, in fact, does not appear to be noticed in later systematic works. In addition to the diagnostic points quoted above, Forster describes it as having the pileum, neck behind, back, rump, thighs, tail, and upper surface of the wings, bluish black; the chin,

[May,

throat, breast, abdomen, crissum and under wing coverts white. Forster's editor, Dr. Lichtenstein, merely says of it, "inter *P. alba* Lath. varietates latens." Mr. G. R. Gray recognizes it in the works above cited as a valid species. An accurate definition of its characters, and an exact exposition of its relationships, together with its synonyms, if it have any, are greatly to be desired.

The bird is apparently some small species of *Æstrelata*. All the points of coloration given, especially those of the under wing coverts, are quite consistent with the characters of *Æ. Cookii*. But the dimensions as stated are quite at variance with those presented by *Cookii*, those of the bill and feet being much too large, while that of the tail is too small; these dimensions being rather those of a small *Puffinus*. In view of these discrepancies, I prefer to coincide with Mr. Gray's high authority in holding it, for the present at least, as distinct; especially as its reference to any described species would be entirely upon supposition.

ÆSTRELATA DESOLATA (Gm.) Bon.

Procellaria desolata, Gmelin, Syst. Nat. i. pars. ii. 1788, p. 562, No. 14. Latham, Syn. iii. part ii. 1785, p. 409, No. 14. Latham, Ind. Orn., 1790, ii. p. 825, No. . . . Kuhl, Mon. Proc. Beit. Zool., 1820, p. 143, No. 13, fig. 7. Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 13; and of authors generally.

Daption desolatum, Steph. Shaw's Gen. Zool. xiii. 1825, p. 244.

Æstrelata desolata, Bonaparte, Consp. Av. ii. p. 189. Excl. var. *rostrata*.—Id., Comptes Rend. xlii. 1856, p. 768.

Procellaria fasciata, Bonnarté, (Gray, Cat. Bds. Pacif. Islands, 1859, p. 56).

Habitat.—Island of Desolation. New Hebrides; Kamtschatka, (Schlegel).

"Pr. ex virescente cinerea, subtus alba, remigibus caudâque rotundatâ obscuris, hac apice fuscâ. * * Rostrum nigrum apice flavicans; tempora ocularumque area alba. Summitas alarum ferè nigra; pedes fuscî; membrana digitos connectens flava; ungues nigri; alis expansis fasciâ obscurâ per omne corpus ab apice ad apicem." [*Gmelin*.]

"Teintes du plumage et des pieds absolument comme celles de la *Procellaria leucoptera*, mais d'une taille beaucoup moins forte, et les penes caudales comme les plumes sous-caudales d'une teinte foncée jusqu'à leur base. Aile 7 pouces 10 lignes; pointe de l'aile 2 pouces 11 lignes. Queue: penes moyennes 3 pouces 5 lignes; penes externes 2 pouces 8 lignes. Bec: longueur 11 lignes; hauteur 3 lignes; largeur 4 lignes. Longueur du tube nasal à-peu-près de 2 lignes. Tarse 12 lignes. Doigt du milieu 12 lignes." (*Schl-gel*.)

This is a species with which I am unacquainted through autopsy. It is the smallest known component of the genus, being less than the little *Cookii*. I have copied Gmelin's original indication of the species; and Dr. Schlegel's measurements of a typical example, from the Temminckian collection; the individual upon which Dr. Kuhl, in 1820, based his description. Both Gmelin and Latham speak of some portion of the bill as being yellow; which was probably an accidental feature in one specimen; for, as is well known, all the *Æstrelatas* have black bills.

This species is so small, and otherwise so well characterized, that it stands in the enviable position of having hardly a synonym, although described in the eighteenth century. I have not met with, or seen anywhere cited, a single synonym, except that of Bonnarté, above given.

ÆSTRELATA MACROPTERA (Smith) Coues.

Procellaria macroptera, Smith, Ill. S. Af. Zool. Bds., pl. 52. Gould, Ann. Mag. N. H., 1844, xiii. p. 362. Gould, Introd. Bds. Aust., p. 116, No. 591.

Ossifraga macroptera, Reichenbach, Syst. Av. t. 21, fig. 786.

1866.]

Pterodroma macroptera, Bp. C. A., 1855, ii. p. 191.

Procellaria brevirostris, Lesson, Traité Orn., 1831, p. 611.

"? *Procellaria lugubris*, Tschudi," according to Bonaparte. Not of Natterer, which is a *Thalassidromine*.

Habitat.—Antarctic Oceans. Coast of Africa. (Smith). Van Diemen's Land. (Gould).

This is a species which I recognize with much doubt. Not having access to the original description by Smith, I cannot speak with certainty regarding it. It is admitted by Bonaparte, who says of it: "Ex toto fuliginoso-cinerea; rostro nigro; pedibus flavidis." On the other hand, Dr. Schlegel refers it to the *atlantica*; and the measurements of two specimens in the Pays-Bas Museum, (one an undoubted *atlantica* received from Mr. Gould, and the other a supposed *macroptera*,) by no means differ in size to a degree incompatible with specific identity. If the expression "pedibus flavidis" is correct, the species would be easily separable. As it is, the only data given by most authors are the larger size, longer wings, and grayer face, as compared with *atlantica*.

It is quite possible that the specimen upon which Dr. Schlegel unites the two names is not a veritable example of *macroptera*. Bonaparte evidently separates *macroptera* from *atlantica* on the strength of the difference in the color of the feet. Mr. Gould says of this species: "I think that a bird I killed in the seas off Van Diemen's Land, where it was tolerably abundant, and which differs from *atlantica* in being of a larger size, having much longer wings and a grayer face, may be identical with *P. macroptera* of Smith, and I therefore retain it under that appellation, in preference to assigning it a new name." Here is an instance in which an author who, in extensive and practical knowledge of the Petrels, is surpassed by no other naturalist, deems the species sufficiently distinct from *atlantica*. But it is quite possible that the bird here referred to is not the true *macroptera* of Smith; and may likely enough be an undescribed species of *Pterodroma*, different from both *macroptera* and *atlantica*, as, indeed, Bonaparte hints, (page 191, Conspectus).

On page 611 of Lesson's Traité, (1831,) there is described a *Procellaria brevirostris*, as follows: "Bec noir, court, tres recourbé; tarses jaune; plumage en entier brun fuligineux; ailes et queue noir intense. Mus. de Paris." This is evidently some species of *Pterodroma*; and upon this description, apparently, or, very possibly, upon the specimen itself in the Paris Museum, Bonaparte has drawn up his diagnosis of the species he calls "*macroptera* Smith." I cannot see why he does not employ Lesson's name, which has priority over *macroptera* Smith, provided the two are synonymous.

As a resumé of the subject, I may state that I think it quite possible there are two species confounded in the synonyma at the head of this article. One is *brevirostris* Lesson, entirely fuliginous, and with yellow feet. The other is the species referred to by Mr. Gould, as above, as distinguished from the common *atlantica* by its larger size, longer wings, and gray face. Whether the latter is the true *macroptera* of Smith remains to be proven. Dr. Schlegel may be perfectly right in referring the *macroptera* Smith to *atlantica* Gould; and yet the two species I am speaking of may also exist, distinct from each other and from *atlantica*.

By Bonaparte the *Procellaria lugubris* Tschudi* is referred with a query to this species. As will be seen by the accompanying foot-note, the bird is evidently some species of *Pterodroma*; though the description is so brief and wanting in measurements that it is impossible to say to which one it is to be referred, or whether it be really a valid new species.

*Tschudi, Cab. Journ. f. Ornith., iv. 1856, p. 85. "The whole body is dark brown, the back somewhat deeper-colored than the belly; the tail wholly black; the inner side of the wing darker than the outer. Bill and feet reddish; iris ashy gray. Surpasses in size the *capensis*; also compressed in form. The description of *P. antarctica* is too inaccurate to say with certainty if it be the species here described. Between 46° and 36°."

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ÆSTRELATA FULIGINOSA (Kuhl) Coues.

Procellaria fuliginosa, Kuhl, Mon. Proc. Beit. Zool. 1820, p. 142, No. 12, pl. x. fig. 6.—(Banks, tab. 19, fide Kuhl; Forst. tab. 93, B. fide Gould.) But not *Proc. fuliginosa*, Kuhl, l. c. species 27, page 148, (Banks tab. 23.) which is a *Nectris*. Also not *fuliginosa* Gm. Lath. which is probably a *Thalassidromine* species. Also not *Puffinus fuliginosus* Strick.—Forster, Descr. Anim. Ed. Licht. 1844, p. 23, sp. 18.—Not the *Nectris fuliginosa* of Forster.—Schlegel, Mon. Proc. Mus. Pays-Bas. 1863, p. 8.

Procellaria atlantica, Gould, Ann. Mag. N. H. 1844, xiii. p. 362. Id. Introd. B. Aust. p. 116, sp. 590, and of authors.

Pterodroma atlantica, Bonaparte, C. A. 1856, ii. p. 191.

Habitat.—Atlantic Ocean, particularly its southern portions.

*Descr.** Bill black. Feet dark colored. Entire plumage including the under wing coverts, fuliginous, becoming almost black on the wings and tail. Bill 1·35. Tarsus 1·60; middle toe and claw 2·20; outer do. about the same, inner do. 2·20. Wing 10·75 to 11·50; possibly to 12·00. Tail 4·50 to 5·00. Total length 15 to 16 inches.

Fine examples of this well known species are in the Philadelphia Academy, some of them typical specimens received from Mr. Gould, and labelled by him "*atlantica*."

This species is certainly the *fuliginosa* of Kuhl's monograph (No. 12, pl. x. fig. 6.) Indeed it is seldom that the descriptions and measurements of the earlier writers are found so entirely pertinent and readily identifiable as in the present instance. The figure of the bill agrees exactly. This identification is made by both Bonaparte and Schlegel. Although the name *fuliginosa* has been applied by several other authors to different species, none of them fall in this genus or indeed among the *Æstrelatae*. (Examine my synonyma, *supra*.) There would seem to be therefore no good reason why the name should not stand for this species, taking precedence over *atlantica* of Gould. To Dr. Schlegel is due, I believe, the credit of restoring Dr. Kuhl's name.

It is quite at variance with the usual great accuracy of Mr. Gould's identifications, that he should have said† that this species "is the *grisea* of Kuhl" (No. 15, fig. 9.) I have endeavored to show, *antea*, what I think the *grisea* of Kuhl really is; but whether my identification—which is the same as that made by Dr. Schlegel—be correct or not, Kuhl's *grisea* is certainly widely different from the present species.

In my Review of the *Puffinæ*, page 124 of these Proceedings for 1864, I maintain the opinion that *fuliginosa*, Forster, sp. 18, p. 23, of Lichtenstein's edition, is a species of *Nectris*; which view I am now satisfied is erroneous. *Procellaria fuliginosa* Forster is the present species, as maintained by Prof. Lichtenstein and Prince Bonaparte. Impressed with Kuhl's remark that his *fuliginosa* is "*omnino diversa a Nectri fuliginosa* Forst.," I did not discriminate between this latter name and the *Procellaria fuliginosa* Forst. p. 23 of Lichtenstein's edition; whence my mistake.

I know nothing of the *Nectris fuliginosa* of Forster, nor do I attempt to identify *Proc. fuliginosa*, sp. 27, ("Banks tab. 23") of Dr. Kuhl's monograph. The latter has recently been identified by Mr. Gray with *Proc. pacifica* of Latham, which is some large species of *Puffinus* (Cat. Birds Pacif. Isl. p. 55.)

In the "Ibis" for 1862, page 245, Mr. G. R. Gray institutes a *Procellaria Parkinsoni*; which is said to be the bird of Bank's icon. ined. No. 19, and (in part) the *Puffinus æquinoctialis* of Gray's list of Anseres of the British Museum, page 160, and is compared with *æquinoctialis* as follows: "being smaller in all its proportions; the bill is nearly one-third less than that of *æquinoctialis*; the

* From specs. in Mus. Acad., Phila.

† Ann. Mag. N. H. 1844, xiii. p. 362.

body is sooty black throughout, being without the white on the mentum; the tips of the mandibles are inclined to black." This description does not show well whether the bird is a *Majaqueus* or a *Pterodroma*; the comparison with *equinoctialis* would seem to indicate the former; while the citation of Banks' Drawings No. 19 (by Kuhl placed under his *P. fuliginosa*—which is the *Pterodroma atlantica*.) would make it a component of the latter group. The habitat of the supposed species is New Zealand.

ÆSTRELATA ATERRIMA (Verreaux) Coues.

Procellaria aterrima, Verreaux. Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 9. *Pterodroma aterrima*, Bonap. C. A. 1855, ii. p. 191.

"*Bulweria aterrima*, Aliq."

"? *Proc. carbonaria*, Solander" fide Bp.

Habitat.—West coast of Africa. Bourbon Island.

A very distinct species, distinguished among its congeners by its size, and the color of the feet. The plumage as in the others of the group is uniform blackish fuliginous; the feet are yellowish, or light colored, passing into black upon the terminal moiety of the toes and the included portions of their membranes. Dr. Schlegel gives the following measurements of a typical example in the Leyden Museum, from Bourbon Island, received from Mr. Verreaux: "Wing 8 7-12 inches; point of the wing 3 5-12; middle tail feathers 3 7-12; external 2 8-12; length of bill $12\frac{1}{2}$ lines; height $4\frac{1}{2}$ lines; width 6 lines; tarsus $16\frac{1}{2}$ lines; middle toe $17\frac{1}{2}$ lines."

ÆSTRELATA BULWERI (Jard. et Selb.) Coues.

Procellaria Bulweri, Jardine and Selby, Ill. Orn. Vol. ii. tab. 65. (No date given on title page and pages not numbered.) Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 9, and of many authors.

Thalassidroma Bulweri, Gray, Gen. Birds, 1849, iii.

Procellaria anjinho, Meineken, Birds Mad. in Brewst. Journ. Oct. 1829, p. 231. (First designation?)

Puffinus columbinus, Webb and Berthelot, Hist. Nat. Canar. ii. part ii. 1836—44, page 44, pl. 4, fig. 2. (Name *Proc. columbina* on plate.)

Bulweria columbina, Bonaparte, C. A. 1855, ii. p. 194.

Habitat.—Atlantic Ocean. Coast of Africa and Europe. Dr. Schlegel has a specimen from Greenland. Very possibly to be included in the Fauna of North America.

This interesting species is the smallest of the genus, and quite distinct from its congeners not only in size but in some of its proportions. It has comparatively a longer tail than most species of the genus; bearing a proportion to the wing from the carpal joint of $4\frac{1}{2}$ to about 8, or more than half. The tail is very cuneate, the difference between the median and outer feathers amounting to 1.75 inches; and the central pair themselves are considerably longer than the next. The under tail coverts,—at least in the specimen before me,—fall nearly two inches short of the end of the longest feathers, being in fact no longer than the upper ones. The folded wings hardly reach to the end of the tail. The bill is about as long as the tarsus, or the middle toe without its claw; of the ordinary *Æstrelatean* type; quite stout at the base, compressed throughout; the unguis large and rising almost immediately from the nostrils, and exceedingly convex; the sulcus on the lower mandible is deep and well marked; the outline of the rami is nearly straight, the gonys very concave; and there is considerable of an emicuentia symphysis. The first primary is hardly if at all longer than the second. The feet present no special peculiarities in relative size or proportions; the inner toe is perhaps slightly shorter than ordinary.

The fuliginous color is deepest, being almost black, on the wings and tail;

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below is lighter and more brownish; on the head has a faint cinereous wash; on the greater wing-coverts is rather paler and grayer.*

Dimensions. Chord of culmen 0.85. Tarsus slightly longer, .90 to 1.00; middle toe and claw 1.16; outer do. about the same; inner do. 0.85. Wing 8.00; tail 4.50; graduation of lateral feathers 1.75.

This little species has been very variously arranged in the series by different authors, as will be seen by the synonyms which head this article. In my mind there is no doubt that Dr. Schlegel has correctly indicated its affinities in placing it in intimate relation with, and next after *aterrima* Verr., albeit he retains it in his somewhat extensive "genus" *Procellaria*. My own reasons for referring it to *Æstrelata* will be found in my remarks under the head of that genus.

I am not enabled to state positively what was the first specific name applied to this species, of the three which head this article. Bonaparte gives precedence to *columbina*; but MM. Webb and Berthelot, in giving this name quote *anjinho*, Heineken, (1829) as above, which must therefore have been published anterior to their own appellation *columbina*. The title page of the work where the latter name appears, bears the date "1836—44." Dr. Schlegel and most other writers give priority to *Bulweri* of Jardine and Selby's Illustrations, a work extending over a series of years. It is figured in volume ii. pl. 65; but the title page bears no date. If not published anterior to 1829 then the name *anjinho* Heineken has priority.

ÆSTRELATA MACGILLIVRAYI (Gray) Coes.

Thalassidroma (*Bulweria*) *Macgillivrayi*, G. R. Gray, Cat. Birds Isl. Pacif. 1859, p. 56. Spec. in British Museum, from the Feejee Islands, (Ngau.)

"Like *T. Bulweri*, but with the bill rather larger; and it is without the sooty brown on the wings." [Gray.]

A species with which I am only acquainted through the above cited very brief indication.

[NOTE.—Just as these sheets are leaving my hands for the printer's I learn through the kindness of my friend Dr. P. L. Slater, of London, of the identification of the "Blue Mountain Duck" of Gosse's Birds of Jamaica. It appears in the Proceedings of the Zoological Society as *Pterodroma Carribæi*, Carte. I was surprised at learning that it is a "*Pterodroma*," as I had confidently anticipated that it would prove to be one of the *Prionæ*; possibly however being prejudiced by the following note upon it by Richard Hill, Esq.† "From the dimensions of our bird, 13 inches long, by some 26 inches in the extent of wing, and from the proportions and character of the bill and nasal tubes, and the grooved mandible, I should say the *Blue mountain petrel* must be classed with the *Prion* of Lacépède, the genus *Pachyptila* of Illiger, the type being the *Procellaria vittata*, * * Our bird has a triple row of palatal teeth," etc.]

PAGODROMA Bonap.

Procellaria sp. Gmelin et Auctorum.

Thalassoica, sp. Reichenbach.

Pagodroma, Bonap. Consf. Av. 1855, ii. p. 192.—Type *Proc. nivea* Gmel.

The bill is very short, being less than half as long as the skull; and exceedingly small, weak, slender and compressed throughout, its base being much higher than broad. The lateral outlines are straight, rapidly converging to a narrow, elongated, rather slender, very convex, moderately decurved and hooked unguis, whose convexity begins immediately at the termination of the nasal case. The lateral sulcus is short, and very oblique. The outline of lower mandible is straight; of gonys a little concave, the angle of the sym-

* Description from spec. in the Philada. Acad. and Mus. Smithson.

† A week at Port-Royal. By Richard Hill. Montego Bay, 1855.

physis slight, the tip a little decurved. The interramal space is narrow, and densely feathered to the symphysis. The nasal tubes are exceedingly short, but broad, high, and turgid, the median line only obsoletely carinated. Their apex is very obliquely truncated, not at all emarginated. The orifice is large, and nearly circular; the internasal septum very thin, and not extending to the termination of the nasal case. The frontal feathers extend far on the base of the bill, running forward on the nasal case with a narrowly rounded termination, and sloping rapidly backwards and obliquely downwards. The outline of the base of the nasal tubes is thus rendered nearly as oblique as their apex.

The wings are rather short, when folded not reaching to the end of the tail. The second primary is not much shorter than the first. All the primaries are rather narrow, regularly tapering to their somewhat acute tips. The tertials and inner primaries are much abbreviated, making the distance in the folded wing, from their tips to the end of the first primary unusually great. The tail is very long, broad, and but slightly rounded, and is contained only about twice in the wing from the carpal joint. All the rectrices are broad to their very tips; which latter are squarely truncated.

The tarsus is as long as the middle toe; moderately stout and compressed; covered with small somewhat elongated irregularly shaped plates, which are rough and elevated, especially posteriorly, and are not notably different in size or shape on the two aspects of the tarsus. The tibiae are feathered to very near the joint. The inner lateral toe with its claw barely reaches the base of the middle claw. The outer lateral toe is longer than the middle; its claw however so short, as hardly to reach to the tip of the middle claw. Claws are rather large, little curved, moderately compressed and acute; the inner edge of the middle one dilated. The hallux is unusually developed, and somewhat depressed in situation; long, stout, acute, and a little curved.

The size is moderate; the form compact and robust; the color entirely pure white.

This is one of the most remarkable generic types of the *Procellariinae*. It is doubtless most nearly related to *Daption*, with which genus its "build" corresponds closely. But, as will be seen on comparing the diagnosis given, it differs in many details of structure, particularly those relating to the bill. From *Estrelata* the peculiarities of bill, of the hallux, comparative lengths of wings and tail, etc., readily distinguish it. The genus has a "physiognomy" or "facial aspect" that is peculiarly its own. The long depressed sloping forehead is found in no other *Procellariidian*. This is produced mainly by the flattening and elongation of the bones composing the forehead; but aided to a considerable degree by the great forward extension of the frontal feathers, which gives to the bill and nasal tubes their extreme brevity; causes such a long rictus; and places the eye, apparently, at so great a distance from the corneous base of the bill.

PAGODROMA NIVEA (Gm.) BOB.

Procellaria nivea, Gm., S. N. 1788, i. part ii. p. 562, and of authors generally.

Daption niveum, Stephens, Shaw's Gen. Zool. xiii. p. 243.

Thalassoica nivea, Reichenbach, tab. 22, fig. 791, 792.

Pagodroma nivea, Bonaparte, C. A. 1855, ii. p. 192.

Procellaria candida, Peale, Zool. U. S. Expl. Exped. 1848, p. 295.

Pagodroma, var. *major*, Bonaparte, l. c.

Pagodroma, var. *minor*, Bonaparte, l. c.

Procellaria nivea minor, Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 16.

Habitat.—Antarctic Ocean and Continent.

Independently of differences in absolute size of body, the species presents unending variations in size, and, to some degree, in shape, of the bill. Specimens differ in this respect by as much as a fourth of the whole length of the

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bill, which may be quite unaccompanied by corresponding differences as to depth or width. The length of the nasal tubes, and the amount of turgidity, and obliquity of truncation vary greatly. Differences in the depth and robustness of bill are surprisingly great.

I have never seen, of many specimens, any which were separable specifically from the typical form. But some individuals are so strikingly small, that were it not for intermediate sizes, they might readily be supposed distinct. Upon this character a variety *minor* was founded by Bonaparte which has been adopted by so accurate and cautious an ornithologist as Dr. Schlegel.

The only synonym of note I have met with is *candidus* of Peale, (1848.). The original description of *P. nivea* by Gmelin speaks of black shafts of some of the feathers. As Mr. Cassin justly remarks (Orn. U. S. Ex. Exped. 1853, p. 416) should this ever be found to characterize a species, the present must bear Mr. Peale's name of *candida*. I think it probable that dark spots or streaks would be indicative of immaturity; but being unfamiliar with the plumage of very young birds, I cannot speak with certainty.

DAPTION Stephens.

Procellaria sp. Linnæus, et Auct.

Daption, Stephens, Shaw's Gen. Zool. xiii. 1825, p. 239. Type *Procellaria capensis*, L.

The bill is much shorter than the skull, about three-fourths the tarsus, rather more than two-thirds the middle toe, very stout, depressed, about as broad as high for its whole length as far as the unguis, where it is suddenly much compressed and higher than broad. Culmen is about straight or a little concave from the nostrils to the root of the unguis, which latter is moderately large, but not very convex nor much decurved. The lateral outline of the bill is decidedly convex from its base to the unguis where the convexity suddenly ceases; it is produced by the large, inflated and protuberant lateral laminae. Just inside the cutting edge of the bill is a series of oblique rugæ, extending the whole length of the bill. The lateral sulcus is well defined, running from the base of the nasal case to the unguis, obliquely downwards and forwards; it is most distinct posteriorly, more shallow anteriorly, where it merges into the depressed portion of the culmen. The lower mandible is perpendicularly narrow, but horizontally is unusually broad, the rami widely diverging from each other immediately from the symphysis. The gonys is short, scarcely convex in outline, its angle small and inconspicuous. The interramal space is very broad, in consequence of the wide divergence of the inferior mandibular rami, and their mutual concavity. The rictus is exceedingly ample; and the capacity of the fauces increased still more by the looseness and dilatibility of the enclosed skin. The feathers on the side of the lower mandible extend but a short distance; those in the interramal space only as far as a point opposite the end of the nasal tubes; and by no means fill the space from side to side when the skin is at all distended.

The nasal case is very long for a component of the group *Æstrelateæ*, being a third as long as the culmen. It is broad, depressed, a little more elevated towards the apex, its dorsal outline a little concave and moderately carinated. The orifice is subcircular, nearly vertically truncated, a little emarginated.

The wings are of moderate length, about equal to the tail when they are folded. The second primary is nearly as long as the first; the rest rapidly graduated. The tail is rather short, contained about two and a half times in the wing from the carpus; is moderately and very evenly rounded; the rectrices being broad to their extreme tips. The upper tail coverts fall an inch short of the end of the tail; the inferior ones quite reach its extremity.

But a very brief portion of the tibia is naked of feathers. The tarsus is much shorter than the middle toe and claw, about equal to the inner toe; very stout, though much compressed; covered externally with very small, irregularly sub-circular plates; which on the inner aspect are much larger and more regular

in shape; the median series of them so broad as to nearly stretch across the inner face of the tarsus. The inner toe is short, the tip of its small weak claw hardly reaching to the base of the middle claw. The outer toe without its claw is decidedly longer than the middle one; but the much greater size of the claw of the latter makes up the difference. The hallux is large and stout; a straight, almost perfectly conical, moderately acute, claw.

This genus is trenchantly separated from all others by the characters of the bill; in the lateral dilatation of which, the widely divaricating rami of the under mandible, and the partially naked and distensible skin of the interramal space, there is seen an approach to *Prion* of the *Procellariinæ*, and also to *Pelecanoides* of the *Halodrominæ*. The superior lateral mandibular laminae are so wide and large, and so inflated, that they give a bulging convex lateral outline to the bill. In the same manner the inferior mandibular rami rapidly diverge from each other, their concavities presenting to the interramal space. In all these points there is an interesting resemblance to the genus *Pelecanoides*; further heightened by the broad ample rictus, loose dilatable skin of the floor of the mouth, which is only partially feathered. These peculiarities are not shared by any other genus of *Procellariinæ* except *Prion*; and leaving out of consideration the widely diverse nostrils, the bills of *Pelecanoides urinatrix* and *Daption capensis* are very similar in shape.

The genus is of moderate size, of robust and compact form, and variegated in the distribution of its colors. Its only known species is the type upon which it is based, the well known *D. capensis*.

DAPTION CAPENSIS (L.) Steph.

Procellaria capensis, Linn., S. N. 10th ed. 1758, p. 132. Linn. S. N. 12th ed. 1766, i. p. 213, No. 5. Linn. Amoen. Acad. iv. p. 240, and of other authors.

Daption capensis, Stephens, Shaw's Zool. 1825, xiii. p. 241: and of later authors.

Procellaria novea, Brisson, Ornith. 1760, vi. p. 146, No. 3.

Procellaria punctata, Ellman, Zool. 1861, p. 7473. Cape Pigeon; Black and White Petrel; Petrel Tacheté; Pintado; Damier; Pardela, etc., Voyager's Vulgo.

This is one of the three species of *Procellaria* given by Linnæus in 1758. It has remarkably few synonyms, in consequence of its marked characteristics. Its features are so well known that no mention of them is necessary in this connection, as the peculiarities of its bill have been elucidated under the head of the genus.

Section PRIONÆ.

The presence of laminated serrations along the inner edge of the upper mandible so trenchantly defines this group, that further characterization is unnecessary. A great similarity of color is found to prevail throughout.

After elimination of the genus *Halobæna* on the ground of its square tail and some other peculiarities, I find among the so-called Prions two very dissimilar types; which I consider as of generic import, and am therefore compelled, however reluctantly, to separate under a new designation.

The three genera here recognized may be thus distinguished:—

- A. Bill compressed, its unguis large, its serrations moderate in extent, or confined to the base of the upper mandible.
 - I. Tail truncated..... *Halobæna*.
 - II. Tail graduated..... *Pseudoprion*.
- B. Bill excessively dilated, depressed, its unguis small and weak; the serrations large and perfect to the extremity of the bill.
 - III. Tail graduated..... *Prion*.

HALOBÆNA Is. Geoffr.

Procellaria sp. Gmelin, et auct.

Prion sp. Gray, Reichenbach, fide Bp.

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Halobæna, "Is. Geoffr. 1836," Bon. C. A. 1855, ii. p. 193. (? Type *P. cærulea*, Gm.)

Chs. Bill provided with a few laminated serrations at the sides of the base of the upper mandible, just within the commissural edge of the upper mandible; in length slightly less than the tarsus, equal to the inner toe without its claw; slender, compressed throughout, a little higher than wide at the base. Superior lateral sulcus well marked, nearly straight; inferior shallow and indistinct. Unguis of upper mandible small, short, only moderately convex. Inferior unguis acute, much decurved, the gonys very concave, the ramal outline straight. Interramal space fully feathered. Nasal tubes only a fifth the length of the culmen, short, narrow, elevated, compressed, not carinated, terminally obliquely truncated; nares narrowly oval. Folded wings reach far beyond tail. Tail contained rather more than $2\frac{1}{2}$ times in the wings from the carpal joint; square, with no graduation of the lateral feathers; all the rectrices so broadly rounded as to be nearly truncated. Tarsus equal to middle toe without claw; outer rather longer than the middle; but its claw so short as to make its total length rather less than that of the middle. Tip of inner claw just reaching base of middle.

The principal character which distinguishes this genus lies in the short, square tail; a feature which is quite unique in this family, being found in no other genus of the *Procellariidæ*. Its type and only known species is the old *cærulea* of Gmelin, a small delicately formed species, whose colors tend chiefly to bluish and white.

In general features of external form, proportions of tarsus and toes, and particularly the shape of the bill, which is much compressed, this genus is quite similar to *Æstrelata*, especially to such of its smaller species as *mollis* and *Cookii*. Nevertheless, the presence towards the base of the bill of distinct serrated laminae, which constitute the essence of the *Prionitic* type,* indubitably fix its position among the latter group, to which also it so closely approximates in color. These laminae only exist for a short distance on either side of the base of the bill; but still they are quite palpable and decided in character; perhaps as much so as in *Pseudoprion turtur* or *ariel*. The small and rather weak unguis, which does not begin to curve almost directly from the unguis, is essentially *Prionitic*, as distinguished from typical *Æstrelatines*. The bill though higher than broad in its whole length, is hardly more compressed than in *P. turtur*. From these considerations, and esteeming, as I believe justly, that the laminations are the essential character of the *Prionæ*, and consequently more weighty than all others, I include the somewhat anomalous genus in this latter group. I regard it as the connecting link between the *Æstrelatæ*, on the one hand, through the genus *Daption*, and the *Prionæ* on the other, towards the true type of which latter it approximates through the subtypical genus *Pseudoprion*.

I quote the reference to Isidore Geoffroy on the authority of Bonaparte, not having the means at hand of verifying the citation. I do not know what species is typical in the original founding of the genus. If it be the one named *Halobæna typica* in the *Conspectus*, then *Halobæna* is equivalent to, and has priority over my *Pseudoprion*; and a generic name is wanting for the *P. cærulea* of Gmelin.

HALOBÆNA CÆRULEA (Gm.) Bon.

Procellaria cærulea, Gmelin, S. N. i. ii. 1788, p. 560. Latham. Ind. Orn. 1790, ii. p. 827. Gould, Birds Aust. pl. 52, and of authors generally.

Halobæna cærulea, Bonaparte, C. A. 1855, ii. p. 193.

* In some genera not of the *Prionæ*, e. g. *Daption*, *Ossifraga*, etc., there are to be found along the inner border of the cutting edge of the upper mandible, a series of rugæ or alternate depressions and ridges, obliquely placed. These, however, are part of the mandible itself, and by no means distinct elements, and therefore are radically different in morphological character from the laminae of the *Prionæ*.

Pachyptila cœrulea, Illiger, Prod. 1811, p. 275.—Steph. Shaw's Gen. Zool. 1825, xiii. p. 252.

Procellaria similis, "Forster's Drawings, No. 86." Forster, Descr. Anim. ed. Licht. 1844, p. 59.

Procellaria Forsteri, Smith, Ill. S. Afric. Birds, pl. 54. But not of Latham, which is *Prion vittatus*.

Habitat.—Antarctic Ocean. Australia.

Color. There is a short and not very conspicuous infra-ocular white line, and a superciliary streak of the same color; but not, however, running far down on the auriculars behind the eye. Above the bird is of a clear cinereous or grayish blue; extending as delicate clouding around the sides of the breast; and deepening on the head, most of the wing-coverts, the outer edges and tips of the four outer primaries, into brownish ash. It is chiefly the lesser wing coverts that are thus darkened; most of the greater ones being nearly as clear as the back. The secondaries and tertiaries are clear cinereous, edged and tipped with white; their inner webs being almost wholly of this color. The inner vanes of all the primaries, but particularly of the first four, are almost wholly pearly white except at their tips. The upper tail coverts are concolor with the back. The exterior pair of rectrices are white, with dark brown shafts; the next two are colored like the back; the rest similar except that a fuscous hue deadens the cinereous towards the end of the feathers, and their tips are squarely, trenchantly, and purely white; each for an increasing distance from without inwards. Forehead, cheeks, lower auriculars, under surface of wings and whole under parts of the body pure white.

Younger birds may be known by a less decidedly cinereous or bluish gray tinge of the upper parts; which tend more or less strongly towards brownish. The forehead is not pure white but mixed with about an equal amount of brownish ash. I have never seen specimens entirely fuscous or brownish cinereous below; but think it probable that such a state of plumage characterizes very young birds.

Dimensions. Chord of culmen 1.12; height of bill at base .45; width slightly less. Tarsus 1.25; middle toe and claw 1.60; outer do. 1.50; inner do. 1.37. Tail 3.50; wing 8 to 9.

There is no other known Petrel with a square tail, conspicuously tipped with white. This peculiarity is mentioned in the various descriptions of the authors cited above in the list of synonyma, so that there is no difficulty in identifying their names. The *similis* of Forster* is said to have "rectrices 12 omnes apice candido-fasciatæ" which positively determines the species, although that author is in error in saying that it has the bill "non pectinatum."

PSEUDOPRION Coues.

Chs Lateral lamellæ of upper mandible normally developed, their surfaces vertical. Lateral outline of bill straight. Dorsal outline concave to the unguis. Unguis comparatively large, its chord forming more than a third of the total length of the culmen. Commissural edge of upper mandible not dilated. Inferior mandibular rami straight, divaricating at an acute angle; the lateral sulcus apparent. No groove for reception of fringe from upper mandible, which is either quite obsolete or imperfectly developed towards the end of the bill. Interramal space narrow, triangular, well feathered. Extension of feathers on side of lower mandible not further than those on culmen. Tail moderately graduated.

TYPE. *Prion turtur* Gould.

In amplification of the differences between the so-called *Prion Banksii*, tur-

* Concerning which Prof. Lichtenstein says very erroneously, "Species obscura, ulteriori examinationi relinquenda. A *Pr. vittata* (*Pachyptila*) non esse diversam nisi ætate suspectior."

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tur, *ariel* and ? *brevirostris*, and *Prion* proper, the following comparison is instituted.

The fringe of laminae is smaller and weaker, and inflected inwards rather than descending vertically; and it is either restricted to a short space near the base of the bill (*turtur*, *ariel*, ? *brevirostris*) being quite obsolete more anteriorly; or if as in *Banksii* it extends to the unguis, it is small, weak and inconspicuous. The lateral lamellae of the bill have scarcely more of development and inflation than in other genera of *Procellariinae*, instead of being immensely hypertrophied; and they have a lateral, vertical aspect, instead of a superior nearly horizontal one. The commissural edge of the upper mandible looks downwards, with little inflation or reflection outwards, and nearly (though not quite except apically) touches the under mandible. There is no groove for the reception of the fringe of the upper mandible; but in its place the ordinary lateral sulcus of the sides of the lower mandible is apparent, though not very strongly marked. The inferior mandibular rami divaricate at an acute angle, and are quite straight, instead of widely diverging with a mutual concavity. The submental space, narrow and triangular instead of broadly conoidal, is quite fully feathered, instead of nearly naked; and doubtless has little of the distensibility which characterizes that of *Prion*. The extent of the feathers on the lower mandible is much more restricted. The unguis of the bill is larger, stronger, more convex, its tip more decurved, the chord of its convexity forming more instead of less than a third of the length of the culmen. The lateral outline of the bill is straight not convex. The tail is shorter than in *Prion*, being contained nearly twice in the wing; and it is less cuneiform. The nostrils and the proportions of the feet, are as in *Prion*; while the entire similarity, almost identity, of the coloration has doubtless had much to do with the referring of the species of this genus to *Prion*.

In the following antithetical table the main diagnostic points of the two genera are contrasted.

PSEUDOPRION.	Differential Elements.	PRION.
a. Poorly developed, or entirely obsolete towards end of bill.	a. <i>Fringe of serrations.</i>	a. Extensively and completely developed throughout.
b. Normal; vertical; not vaulted; nor with inflated free edge.	b. <i>Lateral lamellae of bill.</i>	b. Hypertrophied; horizontal; arched; with inflated free edge.
c. Concave.	c. <i>Dorsal outline of culmen.</i>	c. Straight.
d. Of ordinary size, its chord more than a third of culmen.	d. <i>Unguis.</i>	d. Very small; its chord less than a third of culmen.
e. Straight.	e. <i>Lateral outline of bill.</i>	e. Convex.
f. Absent.	f. <i>Groove for reception of fringe.</i>	f. Present.
g. Apparent.	g. <i>Lateral groove on lower mandible.</i>	g. Wanting.
h. Nearly straight.	h. <i>Cutting edges of lower mandible.</i>	h. Very sinuate.
i. Narrowly triangular, well feathered.	i. <i>Interramal or submental space.</i>	i. Broadly conoidal, nearly naked.
k. Extend no further than those on culmen.	k. <i>Feathers on lower mandible.</i>	k. Extend much beyond those on culmen.
l. Moderately graduated, central feathers not protruding; contained nearly twice in the wing.	l. <i>Tail.</i>	l. Much graduated, central feathers elongated, contained one and a half times in the wing.

PSEUDOPRION BANKSII (Smith) Coues.

Pachyptila Banksii, A. Smith, Ill. S. Afric. Bds. pl. 55.

Prion Banksii, Gould, Ann. Mag. N. H. 1844, xiii. p. 366. Gray, Gen. Birds, iii. 1849, p. 649. Bonaparte, C. A. 1855, ii. p. 193.

Procellaria Banksii, Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 17.

Habitat.—Antarctic regions, coming northward into temperate latitudes of both Hemispheres.

This species may be readily recognized by the continuation to the unguis of the fringe of laminae, whereas in the others of the genus it is confined to a short space near the base of the bill. The laminations are, however, very small anteriorly; and are somewhat deflected inwards.

In colors the species of both *Pseudoprion* and *Prion* are so nearly identical that, compared with *Prion vittatus*, the present species seems to differ in hardly aught else than in the less amount of blackish towards the tail. On the middle feathers it is about an inch in depth; laterally decreasing so rapidly that there is hardly a trace of it on the three outermost. The bill and feet, however, are differently colored.

Dimensions. Bill (chord of culmen) a little more than one inch; width at widest point 0.50, height at base 0.44, at unguis about the same. Nasal tubes .18. Tarsus 1.25. Middle toe and claw 1.50, outer do. about the same; inner do. 1.25. Wing 7.50 to 8.00. Tail 4.00; its graduation about .75.

PSEUDOPRION TURTUR (Banks) Coues.

Procellaria turtur, "Banks icon. 15," and Solander's MSS. fide Bp. ? Kuhl, Mon. Proc. Beit. Zool. 1820, p. 143, No. 14, pl. xi. fig. 8. A. Smith, Ill. Zool. S. Afric. Bds. pl. 54. Gray, Genera Birds, 1849, iii. p. 648. Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 17.

Prion turtur, Gould, Ann. Mag. N. H. xiii. 1844, p. 366. Introd. B. Aust. p. 117, No. 602.—Id. B. Aust. vii. pl. 54. Bonaparte, C. A. 1856, ii. p. 193.

Habitat.—"Whole Pacific Ocean, between 30° and 50° of south latitude." (Gould.)

A species absolutely identical with *P. Banksii* in colors of plumage; but readily to be distinguished from that species by its somewhat smaller size, decidedly slenderer and more compressed bill, and especially by the restriction of the fringe of laminae to the base of the bill, and their very incomplete development. The bill and feet are described as similarly colored with those of *Prion vittatus*; the webs flesh colored. The following measurements, particularly of the bill, taken from a specimen in the Philadelphia Academy, are to be compared with those of *Banksii* above given.

Chord of culmen 1.00; width of bill at base 0.33; height at base 0.37; at unguis the same. Nasal tubes 0.18; tarsus 1.15; middle toe and claw 1.45; outer do. 1.50; inner do. 1.25. Wing 7.25; tail 3.50; its graduation 0.50.

—Authors agree in identifying the *Pr. turtur* of Banks' and Solander's *ineditæ* with the species beautifully figured by Mr. Gould under this name, and distinguished from *Banksii* by the characters given in the preceding paragraphs.

Following the *P. turtur* in Bonaparte's *Conspectus* is given a "*Pr. Rossi*, Gr. Mus. Britann. ex Mar. antarcticis. Similis *Prioni turturi*; sed minor, et proportionibus diversis; rostro latiore." I do not know what this can be; unless, as is quite probable, it indicates the *Prion ariel*, Gould.

PSEUDOPRION ARIEL (Gould) Coues.

? *Procellaria turtur*, Kuhl, Mon. Proc. Beit. Zool. 1820, p. 143, pl. xi. fig. 8. (Also of Lesson, according to Bonaparte.)

? *Procellaria velox*, Banks, ic. ined. No. 16, fide Bp.

Prion ariel, Gould, "Proc. Zool. Soc." Ann. Mag. N. H. 1844, xiii. p. 366.—Introd. B. Aust. p. 117, sp. 605.

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Procellaria ariel, Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 18.

Halobæna typica, Bp. C. A. 1856, ii. p. 194.

Habitat.—Australian Seas.

I have not been able to find where this species is originally described by Mr. Gould, if it has been at all more than named by him. From Dr. Schlegel's description* of typical specimens received by him from Mr. Gould, it appears to have exactly the colors, and the development of the laminae of the bill which obtain in *P. turtur*: and to be distinguished from that species by its smaller size; and a very slender bill, wider than high at the base.

Synonymy. It is a little uncertain to which species the *P. turtur* of Kuhl's Monograph, No. 14, fig. 8, really refers. The figure of the bill agrees quite nearly with a specimen of the *turtur* Gould, of the preceding article of this paper; but the description given by Dr. Kuhl, and especially the measurements rather seem to indicate the present species, *ariel*, Gould. But Dr. Kuhl also gives the measurements "Avis aliquantum major," which rather are those of the true *turtur*. There are cited Bank's *turtur*, pl. 15, and also *Pr. velox* Banks, pl. 16, as synonyma; the first of which (according to most authors) representing the *turtur* of Mr. Gould, and of this paper; the second indicating the true *ariel* of Gould. Under the circumstances, it is evident that Kuhl's *turtur* may be, without violence, referred to either of the two species; and authors are about equally divided in opinion regarding it.

Bonaparte's *Conspectus* does not admit *ariel* as a valid species; but has instead a certain *Halobæna typica* Bp. based upon a specimen in the Paris Museum. He cites "*turtur*" Lesson, Kuhl, fig. 8, and "*velox*?" Banks, pl. 16, as synonyms; and his diagnosis presents no points forbidding the reference of this *H. typica* to the *Prion ariel* of Gould, with which Dr. Schlegel considers it as synonymous.

? PSEUDOPRION BREVIROSTRIS (Gould).

Prion brevirostris, Gould, P. Z. S., 1855, p. 88, pl. 93.

"Upper surface delicate blue; edge of the shoulder, the scapularies, outer margins of the external primaries, and tips of the middle tail feathers black: lores, sides of the head and all the under surface white, stained with blue on the flanks and under tail coverts; bill light blue, deepening into black on the sides of the mandible and at the tip, and with a black line along the side of the under mandible; feet light blue; interdigital membranes flesh color.

Length $10\frac{1}{2}$ inches; bill $1\frac{5}{16}$; wing $6\frac{5}{8}$; tail $3\frac{1}{2}$; tarsi $1\frac{1}{4}$."

I am only acquainted with this supposed species by the plate and description of Mr. Gould, above cited, and can offer no opinion regarding it. The description does not indicate any tangible points of difference from *P. ariel*. By Gray, and, I believe, also by the majority of writers, it is considered as a synonym of *P. ariel*.

PRION Lacépède.

Procellaria sp. Anct.

Prion, Lacépède, Mem. de l'Inst., 1800—1801, p. 514. (Gray).

Pachyptila, Illiger, Prod., 1811, p. 274, No. 132.

Priamphus, Rafinesque, 1815, fide Bp.

The essential characters of this genus lie in the peculiar shape of the bill and the complete development of the serrated laminae, which are the distinguishing features of the group of which it is typical. The modifications to which the bill is subjected produce a result which, compared with other *Procellariide*, may be likened to that seen in the genus *Cancroma* among the

*Schlegel l. c. "Semblable à la *Procellaria turtur*, également par rapport aux lamelles des mandibules; mais de taille moins forte, et à bec plus faible. Aile 6 pouces 2 lignes; pointe de l'aile 2 pouce 3 lignes. Queue; penes moyennes 2 pouces et 8 à 10 lignes; penes externes 2 pouces et 5 à 7 lignes. Bec: longueur 9 à 10 lignes; hauteur 2 lignes et demie; largeur 3 lignes et demie à 4 lignes. Tube nasal, 2 lignes. Tarse 12 à 13 lignes. Doigt du milieu 12 à 13 lignes. Individus de Mers de l'Australie obtenus en 1863 de Mr. Gould."

Ardeidæ. I have not met with as detailed a description of its peculiarities as seems desirable.

The culmen, from the extremity of the nasal case to the root of the unguis, is quite straight. Though rising up as a conspicuous ridge between the deep longitudinal sulci on either side, its outline is broad, flat, depressed, and not carinated. The unguis of the upper mandible is small and weak, and hardly rises above the level of the culmen proper; its convexity and decurvation are slight.

On either side of the culmen, from the root of the nasal case to the junction of the lateral mandibular lamellæ with the unguis, lies a well-marked, deep longitudinal sulcus; the central line of which depression, from the end of the nostrils to the unguis, is occupied by a distinctly defined ridge.

The immensely-developed lateral lamellæ of the superior mandible have so great a lateral extension, as to make the width of the bill at its broadest part nearly two-thirds its length. These lamellæ are arched and inflated throughout; and their surface is superior, not lateral. The free commissural edge is convex in outline; retreating slightly inwards and backwards from the broadest point of the bill, which is a little in advance of its extreme base; converging more rapidly and nearly in a straight line thence to the unguis; it is dilated and bulging posteriorly where it overhangs, but by no means meets or touches, the inferior mandibular rami; more anteriorly, it is deflected downwards, and terminally rests against the unguis of the lower mandible.

From the under surface of the lateral lamella near its free edge grow a series of serrated laminæ, which extend from the very angle of the mouth to the unguis; their outline corresponding nearly to that of the edge of the lamella whence they spring. They are directed downwards, with a little outward and forward inclination. They are longest, largest, and their "set" is most oblique at the broadest point of the bill; whence, as they proceed either forwards or backwards, they diminish in size and become more vertical in direction. It is this fringe of serrations that is in apposition with the under jaw; forming, therefore, the true commissural edge of the upper mandible. These laminæ are, so to speak, a series of plates, antero-posteriorly thin, elastic and yielding; transversely wide and resisting; whence it results that they can readily be bent away from each other; but the series cannot be laterally deflected, as a whole; exactly as is the case with the teeth of a comb.

The nasal tubes are very short, measuring hardly more than a fifth the length of the culmen and unguis; broad and depressed; placed conspicuously high upon the base of the culmen. They are somewhat more elevated apically than basally; their apex is so deeply emarginate as to cause a partial segregation of the two tubes towards their termination. The orifice of each naris is circular; the internasal septum rather wide.

Corresponding with the general shape of the upper, the lower mandible is very broad; its rami widely divaricating, presenting much concavity towards each other. Its cutting edge is very sharp and strongly sinuate for its whole length, being curved in several planes oblique to each other. From the widest point, which is opposite the extremity of the feathers on its side, the rami rapidly converge to the unguis; which latter is very small and weak, its gony very concave in outline, its tip acute and much decurved. There is hardly an eminentia symphysis.

The true lateral sulcus of the rami, seen in most *Procellariinæ*, is wanting. In its place we have, just external to the true cutting edge of the lower mandible, a groove which extends the whole length of the ramus; deepest and most marked posteriorly; apically becoming obsolete. This groove, owing to the inflection of the edge of the mandibular ramus, looks upwards and outwards, and into it the fringe of laminæ are received. More anteriorly where the groove is obsolete, the teeth simply abut against the side of the under mandible.

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The broad space between the widely-separated, mutually concave inferior mandibular rami is occupied by soft, more or less distensible skin, naked of feathers, except a small triangular wedge which extends forwards from the base only to a point but a little in advance of the termination of the feathers on the side of the lower mandible. Even this patch does not fill the space from side to side. The feathers on the side of the lower mandible extend as far as the broadest point of the bill. The frontal feathers project a little on the nasal case. Retreating somewhat, they then stretch transversely across the base of the lateral lamellæ, with no obliquity backwards, to the very edge of the bill; which is thence densely feathered to the angular oris.

Bill about as long as the tarsus; the latter equal to middle toe without its claw; covered with quite regular hexagonal plates, largest antero-interiorly. Outer toe and claw about equal to middle. Tip of inner reaching base of middle. Hallux strong, straight, conical, placed rather low down. Folded wings not surpassing tail. First and second primaries about equal; last successively more rapidly graduated. Tail long; two-thirds the wing from the carpus, or contained one and a half times in it; cuneate; central rectrices acuminate rounded and somewhat projecting; lateral ones more broadly rounded and much graduated in length.

PRION VITTATUS (Gm.) Lacép.

Procellaria vittata, Gmelin, S. N. i. pars ii. 1788, p. 560, and of authors.

Prion vittatus, Lacépède, Gray, Gen. Birds, 1849, iii. p. 649, and of later authors.

Pachyptila vittata, Illiger, Prod., 1811, p. 275.

Procellaria Forsteri, Latham, Ind. Orn. ii. 1790, p. 827. Not of Smith.

Pachyptila Forsteri, Swainson, Class. Birds, ii. p. 374. Lesson, Traité, 1831, p. 613. Jard. and Selb. Illust. Orn. pl. 47. Steph. Gen. Zool. xiii. 1825, p. 251.

Procellaria latirostris, Bonnarté, Ency. Metod.

Habitat.—Southern portions of both Atlantic and Pacific.

Line over the eye white. A transocular dusky fascia. Entire upper parts light grayish or plumbeous blue; which color, somewhat diluted, clouds the sides of the breast and the flanks. Edge of wing, lesser coverts, outer vanes and tips of four first primaries, and terminal area on tertials, blackish plumbeous. Inner vanes of quill feathers and tips of tertials fading into pearly or grayish white. Tail concolor with back; passing terminally into plumbeous black; which, from an extent of $1\frac{1}{2}$ inches on the central rectrices, decreases successively to a bare trace on the outer ones. Under tail coverts white, somewhat clouded with plumbeous. All other parts are pure white. "Bill light blue, deepening into black on the sides of the nostrils and at the tip, and with a black line along the sides of the under mandible; irides very dark brown; feet beautiful light blue." [Gould.]

Dr. Kuhl's fig. 13, and M. Temminck's Pl. Col. 528, are by Dr. Schlegel supposed to refer to the *P. Banksii* rather than to this species, contrary to the opinion entertained by most ornithologists. The former figure measures eleven-sixteenths of an inch in width at the widest part of the bill; a dimension which the *Banksii* is hardly known to attain.

In accordance with the views entertained in the preceding pages, the following synopsis of the genera and species of the two sections treated of is prepared.

Family PROCELLARIIDÆ.

Subfamily PROCELLARIINÆ.

Section *Æstrelatæ* (Bp. 1855).

The cutting edge of the upper mandible is not dilated nor furnished with serrations.

1866.]

Genus I. *ÆSTRELATA* Bp., 1855. Bill robust, compressed, its unguis large, hooked from the nostrils. Interramal space narrow, fully feathered. Extension of feathers on forehead moderate. Nasal case short. Tail more or less cuneiform, the lateral rectrices much graduated. Hallux of ordinary size.

1. A. *HESITATA* Coues, ex *Proc. hesitata* Kuhl. Not of Forst., Reich., Gld. nor *Puff. hesit.* Lawr. *Proc. brevirostris* and *meridionalis* Lawr., or *Fulmarus merid.* Bp., but not *brevirostris* Less. *Puffinus Herminieri* Less. *Æstrelata diabolica* Bp. Large; pileum and upper parts brown; upper tail coverts, basal half of tail, forehead and neck all around white. Bill or tarsus 1.45; wing 12.00; tail 5.50; middle toe and claw 2.12.

2. A. *LESSONI* Cassin, ex *Proc. Lessoni* Garnot. *Rhantistes Lessoni* Bp. *Proc. leucocephala* Forst. *Æstrelata leuco.* Bp. ? *Pr. alba* Gm. ? *Daption album* Steph. *Pr. variegata* Bonn. *Pr. vagabunda* Sol. secundum Bp. Large; head all around white, except a transocular fascia. Back deep ash. Tail and coverts ashy gray. Bill 1.50; tarsus 1.65; middle toe and claw 2.50.

3. A. *ROSTRATA* Gray, ex *Pr. rostrata* Peale. *Rhantistes rostr.* Bp. Large, bill exceedingly robust, along chord of culmen 1.37; height or width at base 0.66. Wing 11.00, tail 4.75. Tarsus 1.75. With the pattern of coloration and nearly the tints of young *Lessoni*. Frontal feathers running far forward on the nasal case.

4. A. *PARVIROSTRIS* Coues, ex *Pr. parvirostris* Peale. *Rhantistes parvir.* Bp. Medium, bill slender and compressed, its length 1.08. Tarsus 1.25. Outer toe and claw 1.66. Young? Above deep fuliginous brown, (no trace of ashy,) this color extending all around the head and neck, on the tips of the feathers.

5. A. *INCERTA* Coues, ex *Pr. incerta* Schlegel.—Large. Wing 11.50; tail nearly 5, much graduated. Bill 16 to 17 lines; height 5 lines. Tarsus 1.50. Colors as described much those of young *Lessoni*; to which the species may be referrible.

6. A. *NEGLECTA* Coues, ex *Pr. neglecta* Schlegel.—Medium, with the colors of *incerta*. Bill; length 1.12; height 4 to 5 lines. Wing 10.00 inches. Perhaps to be referred to *parvirostris*.

7. A. *SOLANDRI* Coues, ex *Proc. solandri* Gould.—*Cookilaria solandri* Bp.—*Pr. melanopus* Natt. nec. Gm.—Large; very robust. Length 16; bill 1.75; wing 12; tarsus .75; tail 5.50; middle toe and claw 2.37. Bill and feet black. Above dark brown; becoming slate gray on middle of back, and wing and tail coverts. Young? Washed with gray on the abdomen.

8. A. *GRISEA* Coues, ex *Pr. grisea* Kuhl, according to Schlegel's identification.—*Pr. lugens* Banks, Forst. ined. *Æst. inexpectata* Bp. nec. Forst. Medium, generally like *mollis*; with a more compressed bill, and some discrepancies in dimensions. Wing 9.50; tail 3.88; bill $11\frac{1}{2}$ lines; tarsus $16\frac{1}{2}$ lines; middle toe 19 lines.

9. A. *MOLLIS* Coues, ex *Pr. mollis* Gould.—*Cookilaria* and *Rhantistes mollis* Bp.—*Pr. inexpectata* Forst.—? *Pr. melanopus* Gm. Vieill. Steph.—? *Pr. gularis* Peale.—? *Pr. Philippii* Gray.—? *Pr. crepidata* vel *sandaliata* Sol. according to Bp. Medium, bill (chord of culmen) 1.10; height at base .45; width slightly less; tarsus 1.33; outer toe and claw 1.75; wing ranging from 9.50 to 10.50; tail 4.50. Under surfaces of the wings concolor with the upper.

10. A. *COOKII* Coues, ex *Pr. Cookii* Gray.—*Rhantistes Cookii* Bp.—*Pr. leucoptera* Gld. *Cookilaria leucoptera* and *C. velox*, *Rhantistes velox* Bp. *Pr. brevipes* Peale. Small. Bill 1.00, height at base .35. Wing 8.50 to 9.00; tail 3.75 to 4.25, its lateral graduation 1.00 to 1.50. Tarsus 1.10. Under wing coverts and a line along edge of fore arm white.

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11. A. *GAVIA* Coues, ex *Pr. gavia* Forst. (following G. R. Gray's authority.) Small; with the colors generally those of *Cookii*, including under wing coverts. "Expanse 26; bill 1.50; tibiae 1.75; tail 2.50," [Forst.]

12. A. *DESOLATA* Bp. ex *Pr. desolata* Gm.—*Daption desolatum* Steph. Smallest. With the general colors of *Cookii*. Wing 7.80; tail 3.40, its graduation .75. Bill less than one inch. Tarsus or middle toe about 1.00.

13. A. *MACROPTERA* Coues, ex *Pr. macroptera* Smith.—*Ossifraga macroptera* Reich.—*Pterodroma mac.* Bp.—*Pr. brevirostris* Less. nec. Lawr.—? *Pr. lugubris* Tsch. Large; wings long; face gray; tarsi yellow.

14. A. *FULIGINOSA* Coues, ex *Pr. fuliginosa* Kuhl, sp. 12, (not *fulig.* Kuhl, sp. 27; not of Gm. Lath.; not *Puff. fulig.* Strickl. not *Nectris fulig.* Forst.)—*Pr. atlantica* Gld. *Pterodroma atl.* Bp. Large. Everywhere fuliginous; feet dark colored. Bill 1.35. Tarsus 1.60; middle toe and claw 2.20; wing 10.75 to 11.50; tail 4.50 to 5.00.

15. A. *ATERRIMA* Coues, ex *Proc. aterrima* Verr.—*Pterodroma aterrima* Bp. Small. Tarsi light colored, passing into black upon the terminal portion of the toes. Wing 8.50; tail 3.50; bill slightly more than an inch. Tarsus 1.33.

16. A. *BULWERI* Coues, ex *Pr. Bulweri* Jard. and Selby. *Thalassid. Bulweri* Gray.—*Pr. anjinho* Ilcineken.—*Puffinus columbinus* Webb and Berth.—*Bulweria columbina* Bp. Smallest. Proportionate length of tail to wing as 4.50 to 8; graduation of tail 1.75 to 2.00. Bill .85; tarsus a little longer.

17. A. *MACGILLIVRAYI* Coues, ex *Thalassidroma (Bulweria) macgillivrayi* G. R. Gray. Like *Bulweri*; bill larger; no sooty brown on wings.

18. A. *CARRIBEI* Coues, ex *Pterodroma carribæi* Carte. "Blue Mountain Duck," Gosse.

Genus II. *PAGODROMA* Bp. 1855. Bill very short, moderately strong and compressed. Forehead flattened; and lengthened by the extension forward of the feathers. Interramal space narrow, densely feathered. Nasal tubes short. Hallux unusually developed. Tail long, broad, but slightly rounded.

19. P. *NIVEA* Bp. ex *Pr. nivea* Gm.—*Daption n.* Steph. *Thalassoica n.* Reich.—*Proc. candida* Peale. *Pagodroma* var. *major* Bp. Entirely white. Subject to great variations in size; forming var. *minor* Bp.

Genus III. *DAPTION* Steph. 1825.—Bill much dilated, unguis small and weak. Interramal space wide and partially naked, oblique sulci on inner face of cutting edge of mandible. Nasal tubes long. Hallux of ordinary size. Tail rather short, moderately rounded.

20. D. *CAPENSIS* Steph. ex *Pr. capensis* Linn.—*Pr. nævia* Briss.—*Pr. punctata* Ellm. Spotted with black and white on upper parts.

Section *PRIONÆ* (Bp. 1855.)

The upper mandible is furnished near its edge with laminated serrations.

Genus I. *HALOBÆNA* Is. Geoff. External form of bill much that of *Æstrelata*; serrations few and inconspicuous. Tail truncated.

1. H. *CÆRULEA* Bp. ex *Pr. cærulea* Gm. *Pachyptila cærulea* Ill. Steph. *Pr. similis* Forst. *Pr. Forsteri* Smith, nec. Lath. Tail tipped with white.

Genus II. *PSEUDOPRION* Coues. Serrations poorly developed or quite obsolete towards end of bill. Lateral lamellæ of bill normal, their free edges uninflated. Culmen concave; lateral outline of bill straight. Interramal space narrow, well feathered. No sulcus for reception of fringe. Tail moderately long and rounded, contained nearly twice in the wing.

1866.]

2. PS. BANKSI COUES, ex *Pachyptila Banksii* Smith.—*Prion B.* Gld. *Procellaria B.* Schl. The fringe of serrations is apparent to the end of the bill. Chord of culmen 1.05; width of bill at widest point .50; height at base .44.

3. PS. TURTUR COUES, ex *Proc. turtur* Banks "icon. ined. No. 15."—Also of Kuhl? *Prion turtur* Gld. The fringe of serrations is confined to the basal portion of the bill. Chord of culmen 1.00; height of bill at base .37; width .33.

4. PS. ARIEL COUES, ex *Prion ariel* Gould.—? *Proc. turtur* Kuhl.—*Proc. ariel* Schl. *Halobæna typica* Bp.—? *Prion brevirostris* Gld. Smaller than *turtur*. Bill 9 to 10 lines, height $2\frac{1}{2}$ lines; width $3\frac{1}{2}$ to 4 lines.

Genus III. PRION Lacép. 1800—1. Serrations developed to the maximum. Lateral lamellæ hypertrophied, with inflated free edges. Culmen straight: lateral outline of bill convex to the unguis. A deep sulcus on either side of the culmen; another on the lower mandible for reception of the fringe. Inter-ramal space broad, nearly naked. Tail elongated, much graduated, contained $1\frac{1}{2}$ times in the wing.

5. PR. VITTATUS Lacép. ex *Proc. vittata* Gm. *Pachyptila vitt.* Ill. *Proc. Forsteri* Lath. nec. Smith. *Pachypt. Forsteri* Swains. *Proc. latirostris* Bonn. Greatest width of bill three-fourths of an inch or more.

In a subsequent paper will be considered the *Diomedinæ* and *Halodrominæ*.

Critical Review of the Family PROCELLARIIDÆ;—Part V; embracing the DIOMEDEINÆ and the HALODROMINÆ. With a General Supplement.

BY ELLIOTT COUES, M. D., U. S. A.

The group composed of the Albatrosses is so trenchantly distinguished from all other *Natatores*, that for its definite characterization it is only necessary to advert to the absence of the hallux, and to the position of the rhinothecæ. In other morphological points the Albatrosses conform closely to the type of structure which obtains throughout the *Procellariinæ*.

The Halodromes, if really components of the family *Procellariidæ*, are the most curiously aberrant of all the *Gaviæ* or Longipennine *Natatores*. They appear to hold a quite anomalous position, intermediate between several *natatorial* suborders. The very short falcate wings, no less than the absence of the hallux; the general configuration of the body, and especially the position of the posterior extremities relative to the axis of the body; as well as the compactly imbricated, glossy plumage; indicate a close affinity with the *Urinatores*, or Brachypterous *Natatores*. These structural resemblances are borne out by the attitudes, habits, and mode of life of the species, so far as we are acquainted with them; which are rather those of Guillemots than of Petrels. The dilation of the bill, particularly of the under mandible, and the partially naked and distensible submental skin, which forms an imperfect pouch, point to a type of structure extensively prevailing among the *Totipalmi*. Most of the latter have the rhynchotheca segmented; so that almost the only character of the Halodromes which is strictly *Procellariidian* is the tubulation of the rhinotheca; and even in this feature the details of shape and direction of axis are entirely unique. So far indeed as external characters are concerned, arguments are adducible for their reference to either of the three tribes above alluded to; and especially to the *Urinatores*. It remains for the scalpel to finally determine their true affinities.

By Illiger* the tubulation of the rhinotheca has been made indicative of a tribe (although called a family) *Tubinares*, which is attaching to it a value coördinate with such a character as *e. g.* the membranous union of the hallux

* Prodrómus, 1811, p. 274.